



THE RESOURCE FOR INFORMATION EXECUTIVES

a special issue  
technology's  
impact on

\*every  
thing

with essays by

Kenneth Allard Robert Ballard  
Andy Borowitz Ben Crenshaw  
The Dalai Lama David Elkind  
Juan Enriquez Howard Gardner  
Newt Gingrich Ray Kurzweil  
Bjorn Lomborg Queen Noor  
Robert Reich Howard Rheingold  
Paul Saffo Robert Shiller  
Barry Steinhardt & Jonathan Zittrain

\*Including...Financial Markets, War,  
The Human Condition, Work,  
Education, Kids, The Environment,  
Sports, Public Opinion, Health  
Care, Spirituality, Power, Civil  
Liberties, Exploration, Evolution,  
The Future, and more...



*Ralph Szygenda, Group Vice-President and CIO, General Motors*

Confessions of the World's Most Demanding CIOs.

# "To the future. And step on it."

"In the mid 90s, GM needed a change—and it couldn't come fast enough. Our challenge? Transform one of the world's largest corporations into a real-time, go-fast company—which meant major IT changes. From the beginning, HP Services was a critical partner providing the technology and solutions that were instrumental to our vision.

"The result? Today, we bring new vehicles to consumers in less than 24 months, versus 42 in the past. We've consolidated our information systems by over fifty percent. And we're putting better quality automobiles on the road than ever before—all while saving hundreds of millions of dollars a year through the use of precision information technology.

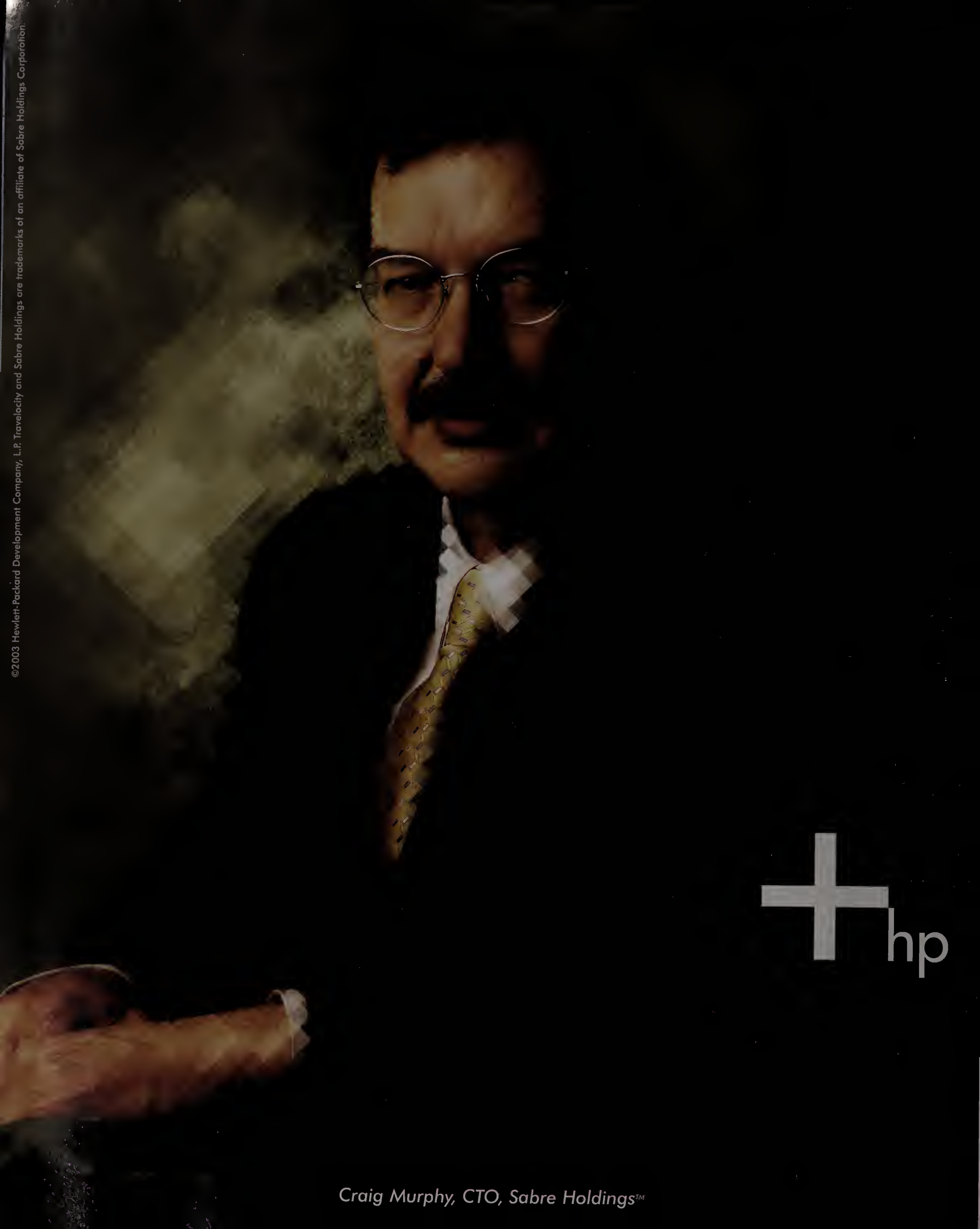
"HP listened, instead of talking. HP sold ideas, instead of pushing product. HP over-delivered, instead of over-promising. As a result, GM is racing toward the future—a real-time, go-fast company."

General Motors demands more from IT and HP makes sure they get it.

= *everything is possible*

[www.hp.com/go/demandmore](http://www.hp.com/go/demandmore)





Craig Murphy, CTO, Sabre Holdings™

Confessions of the World's Most Demanding CIOs.

# "In a word, I need fasterbettercheaper."

"It's what travelers want, too. Faster-better-cheaper drives our businesses—from Travelocity® to managing vital systems for the world's airlines. We process travel transactions by the hundreds of millions. Which means analyzing billions of fare combinations across countless route alternatives, and doing it in seconds.

"HP came in and made faster-better-cheaper a reality for us. Their team designed an open solution that delivers business continuity and horizontal scaling across multiple platforms. High-end, fault-tolerant resources are focused on critical processes. Other tasks get passed off to cost-efficient systems. And HP is accountable for it all.

"We've doubled productivity, our cost of ownership is way down and we consistently find the lowest fare more often than our competitors. Sum that up in one word."

Sabre Holdings demands more from IT and HP makes sure they get it.

= *everything is possible*

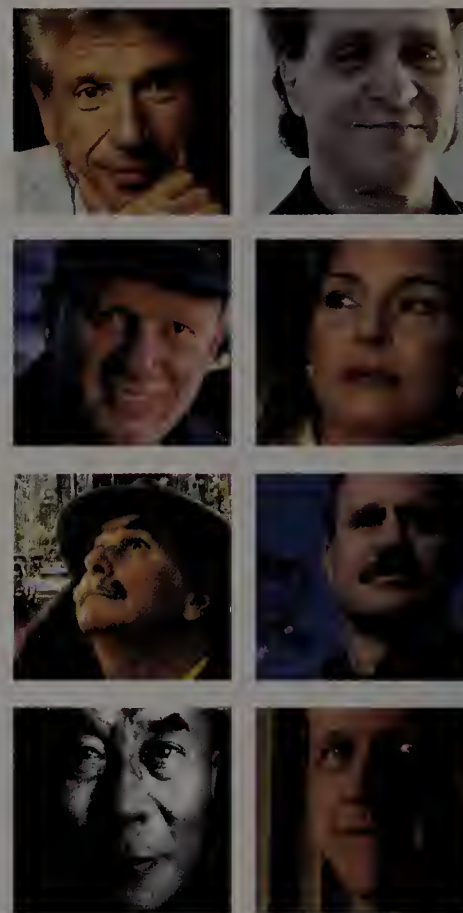
[www.hp.com/go/demandmore](http://www.hp.com/go/demandmore)





special issue  
fall/winter 2003

# technology's impact on \*every thing



Featured in this special issue are some of the world's foremost thought leaders. Photos of some of our contributors, above, include (clockwise from top left): David Elkind, Ray Kurzweil, Queen Noor, Paul Saffo, Robert Shiller, The Dalai Lama, Howard Rheingold, and Robert Ballard.

## INTRODUCTION | 18

### THE FUTURE | 22

Ray Kurzweil  
Promise and Peril of  
the 21st Century

### MARKETS | 28

Robert J. Shiller  
New Hope for Old Risks

### WAR | 29

Col. Kenneth Allard  
Battlefield Information  
Advantage

## THE HUMAN CONDITION | 32

Queen Noor  
Women in the  
Developing World

### THE ENVIRONMENT | 34

Bjorn Lomborg  
What's Natural

### WORK | 36

Robert Reich  
Jobless in America

## EDUCATION | 40

Linda Abarbanell &  
Howard Gardner  
Teaching Our  
Children Well

### KIDS | 44

David Elkind  
The Reality of  
Virtual Stress

### SPORTS | 46

Ben Crenshaw  
Too Much of a  
Good Thing

more »



## Get ready to go for the green.



In business, as in golf, the distance you go depends on your agility. Outsourcing with EDS can enhance that agility. Our technology and business process solutions include application development and management, desktop and hosting services, financial process and procurement management, CRM, HR services and more - all based on industry-best practices. For more than 40 years, we've provided clients with insights, technology, tools and processes that accelerate productivity, time-to-market and ROI. Learn how we can help you reach the green in fewer strokes. Visit [eds.com](http://eds.com) or call 800 566 9337.





features continued

**CONNECTIONS | 48**

Jonathan Zittrain  
The End of Hide-and-Seek

**PUBLIC OPINION | 50**

Paul Saffo  
Convenience Trumps Privacy

**HEALTH CARE | 53**

Newt Gingrich  
The Cure for What Ails Us

**HEALTH INFORMATION | 56**

Juan Enriquez  
The Data That Defines Us

**SPIRITUALITY | 58**

The Dalai Lama  
Computers and the Buddha Nature

**POWER | 60**

Howard Rheingold  
The War Over Innovation

**CIVIL LIBERTIES | 62**

Barry Steinhardt  
Taming the Surveillance Monster

**EXPLORATION | 64**

Robert Ballard  
20,000 Leagues Over the Web

**EVOLUTION | 68**

Andy Borowitz  
Danger, Stupid Human! Danger!

also in this issue

**TRENDLINES | 12**

The human genome project—13 years and counting; Can wireless lift all boats?; Change management with Michael Hammer and Esther Dyson; Robot reality.

**INDEX | 66**

**TRENDLINES | 12**

technology's impact on...

This special issue-themed Trendlines section looks at technology's lasting effects on biomedicine, developing nations' IT infrastructures, business management and communicating with machines.

technology's  
impact on  
~~every~~  
thing  
ONLINE

Share Your Thoughts

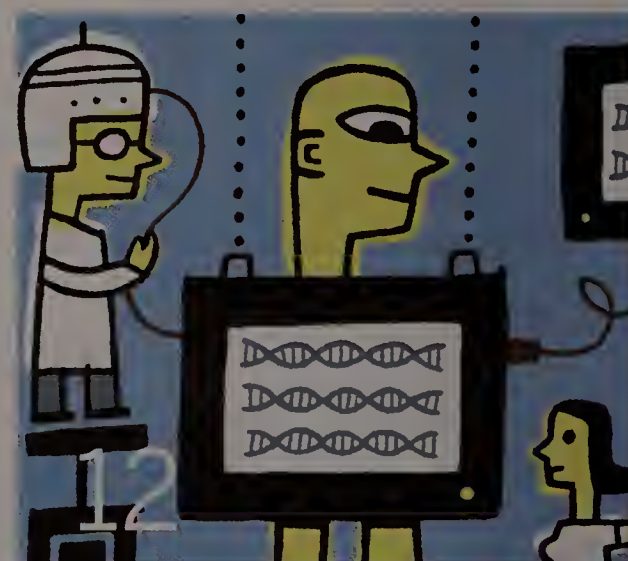
Do you agree with **Newt Gingrich** on the power of technology to save health care? Is **Ray Kurzweil** right not to fear uncontrolled, engineered biological viruses? Did **David Elkind** get it wrong when he says children's play rituals are disappearing?

If one or two—or more—of the essays in this special issue get you thinking, go online to share your thoughts. We've set up special **discussion areas** for each of the leading thinkers' essays. Go to [www.cio.com/impact2003](http://www.cio.com/impact2003) to tell Newt—and **Howard Rheingold**, **Robert Reich**, **Robert Ballard** and **Ben Crenshaw**—what you think.

About the Authors

The full text of all the essays presented in this issue appear online, as well as **expanded bios** on each of the essayists. We also give you **links** to their most recent **books** and each of their **websites**—even **Queen Noor** has one.

[CIO.com/impact2003](http://cio.com/impact2003)



energy & power • industry & automation • information & communication • medical systems & healthcare • financial services • lighting • transportation

# Spacious corner office, redefined.

Business is no longer confined by four walls. Today, people need to access and exchange information – anytime, anywhere. Thanks to Siemens Next Generation Internet solutions, they can. From cellular phones to business communication systems to optical networks, we provide the tools that make Mobile Business a reality. As a leader in everything from information and communications, to healthcare to industry and automation, Siemens is in a unique position to make all our lives better. When you have 450,000 minds working together all around the globe, including 75,000 right here in the U.S., innovative solutions emerge. And that's what it takes to change the world.

## SIEMENS

Global network of innovation



# The Resource for Information Executives

**President** Walter Manninen

**Publisher** Gary J. Beach

**Editorial Director** Lew McCreary

## EDITORIAL

**Editor in Chief** Abbie Lundberg

**Deputy Editor** Richard Pastore

**Managing Editor** David Rosenbaum

**Managing Editor, Production** Cheryl R. Asselin

**Executive Editors** Alison Bass, Michael Goldberg, Christopher Koch (Investigations)

**Leadership and Management Editor** Edward Prewitt, **Opinion and Knowledge Management Editor** Megan Santosus, **Research Editor** Lorraine Cosgrove Ware, **Special Projects Editor** Mindy Blodgett, **Technology Editor** Christopher Lindquist

**Senior Editors** Scott Berinato, Todd Datz, Alice Dragoon, Elana Varon (B2B E-Commerce)

**Features Editor** Lafe Low

**Senior Writers** Meredith Levinson (B2C E-Commerce), Stephanie Overby, Sarah D. Scalet (Security and Privacy)

**Staff Writer** Ben Worthen

**Copy Chief** Tom Wailgum

**Asst. Managing Editor, Production** Kathleen S. Carr

**Copy Editors** Kelli A. Gauthier (Assoc.), Emily S. Henderson, Sarah Johnson (Assoc.)

**Special Projects Manager** Lynne Z. Rigolini

**Editorial Resource Manager** Carol Zarrow

**Editorial Assistant** Daniel J. Horgan

**Contributors** Stacy Cowley, Marc Ferranti, Tom Krazit, Pat McCaffrey

**Editorial Operations Specialist** Julie Hanson

## DESIGN

**Executive Director, Art and Design** Mary Lester

**Art Directors** Hana Barker, Terri Haas, Lisa Munroe

**Associate Art Director** Owen Edwards

**Senior Designers** Kaajal S. Asher, George Lee

**Designer** Alberto Capolino

**Design Operations Specialist** Rachel Barnett

## ONLINE EDITORIAL

**Web Editorial Director** Art Jahnke

**Consulting Editor** Janice Brand

**Web Editor** Sandy Kendall

**Web Writer** Jon Surmacz

## ONLINE & INFORMATION SYSTEMS

**Chief Information Officer** Mark Hall

### Online

**Senior VP/General Manager, Online** Tim Horgan

**Director, CIO Best Practice Exchange** Martha Heller

**Program Manager, CIO Best Practice Exchange** Sari Kalin

**Operations Asst., CIO Best Practice Exchange** Lisa Byron

**Online Technology Director** Dagmar Eiben

**Senior Web Developer** Ellen Morey

**Director of Online Research** Kathleen Kotwica

**E-Commerce Manager** Andrew Burrell

**Web Developers** Diane Chen, Shannon Macdonald

**Online Content Researcher** Tara Gillet-Liloia

**Designer** Graham White

### Information Systems

**Infrastructure Manager** James C. Burgoyne

**User Services Manager** Ron Bettencourt

**Senior User Services Specialists** Jonathan Frappier, Michael Fahlsing

**System Administrator** Robert Reagan

## CIRCULATION

**Senior VP/Circulation** Carol A. Spach

**Circulation Director** Faith Marcello

**Subscription Svcs. Supervisor** Tina Pescaro

## PRODUCTION

**VP/Manufacturing** Chris Cuoco

**Production Manager** Lee Tuttle

**Senior Production Coordinator** Lisa Stevenson

## EXECUTIVE PROGRAMS

**EP Senior Vice President** Jennifer Richards

**Conference Management Vice President** Cynthia Mollus

**Marketing Services Director** Shellie Rapson James

**Business Development VP** John Amato

**Program Operations Manager** Brian Fuce

**Marketing Manager** Glede Kabongo

**Marketing Services Coordinator** Andrea Slobogan

**Event Development Specialist** Sandra J. Hughey

**Operations Coordinator** Michael Barbato

**Event Planning Manager** Amy Turell

**Senior Customer Services Coordinator** Sarah Yee

## MARKETING

**Executive VP/Marketing** Cathy O'Leary Hayes

**VP/News and Information** Susan Watson

**Media Relations Manager** Karen Fogerty

**News and Information Associate** Lori Piscatelli

**Marketing Research Director** Bridget Cammarata

**Marketing Research Manager** Carolyn Johnson

**Sr. Marketing Research Analyst** Dylan DiGregorio

**Marketing Comm. Director** Sue Yanovitch

**Sr. MarCom Development Specialist** Kari Curto

**Marketing Comm. Associate** Sarah Crowley

## ADMINISTRATION

**Manager of Finance** Margarita Chiango

**Finance and Operations Analyst** Chris Bernardi

**Executive Assistant to the President** Diane Martin

**Billing Administrator** Joyce Gillis

**Facilities Specialist** John Kelley

**Office Services Coordinator** Mary E. Wooldridge

## HUMAN RESOURCES

**Human Resources Vice President** Patricia Chisholm

**Human Resources Manager** Tanya Bureau

**Human Resources Representative** Beth S. Ramistella

## FOUNDER

Joseph L. Levy



CXO MEDIA INC.

## INTERNATIONAL DATA GROUP

**CEO** Pat Kenealy

**Board Chairman** Patrick J. McGovern



© CXO Media Inc.

## How to Reach Us

**E-mail** [letters@cio.com](mailto:letters@cio.com)

**Phone** 508 872-0080

**Fax** 508 879-7784

**Address** CIO Magazine, CXO Media Inc.,  
492 Old Connecticut Path, P.O. Box 9208,  
Framingham, MA 01701-9208

**Website** [www.cio.com](http://www.cio.com)

**Topic Experts** [www.cio.com/online\\_beats2.html](http://www.cio.com/online_beats2.html)

**Subscriber Services** 866 354-1125, Fax 847 564-9453,  
E-mail [cio@omeda.com](mailto:cio@omeda.com)

**Reprint Services** Contact Chad Johnston at 651 582-3800, E-mail  
[cioeprints@rsicopyright.com](mailto:cioeprints@rsicopyright.com) (500 quantity or more)

**Rights and Permission** Andrew Burrell • 508 935-4785,  
E-mail [aburrell@cxo.com](mailto:aburrell@cxo.com)



## Baylor goes to the head of the IT class.



### **Baylor University** **Deploys *Business-Driven Network*.™**

Serving the educational and recreational needs of 14,000 students is a tall order for any IT department. You have to ensure access to critical classroom resources as well as provide the Internet and e-mail services expected by today's technology-savvy students. And security cannot be compromised.

That's why Baylor University turned to Enterasys and its unique **Secure Networks** solution. Through a simple-to-administer interface, IT managers can assign very specific access privileges that stay with students wherever or however they log on. From class or the residence hall. Wired or wireless.

The network runs smoother. Security is pervasive. And students are happy.

Get the full story at [enterasys.com/baylor](http://enterasys.com/baylor)

### **Exclusive!** **Secure Networks Webcast**

Don't miss this informative webcast featuring Gartner and other industry experts as we address the best practices for deploying enterprise-wide security.

**Register now!**

Visit us at [itworld.com/enterasyssecurity](http://itworld.com/enterasyssecurity)

# **ENTERASYS**

---

## **NETWORKS™**

A person wearing a brown tweed jacket is holding a black smartphone in their right hand. The background is a blurred indoor setting.

Tech  
Savvy

Business  
Savvy

# The right software can help today's CIO become tomorrow's corporate leader.

It's amazing what the right software can do in the right hands. Just ask many of the CIOs taking advantage of our management software for utility computing. They've been able to transform their previously complex disparate infrastructures into springboards for business success. Using our seamlessly integrated management software, they've been able to take advantage of tomorrow's trends while heading off today's problems before they ever happen. And they've been able to do it all by maximizing their existing resources, not ripping and replacing what they already have. To learn more about how management software can benefit your business, not to mention your career, go to [ca.com/management3](http://ca.com/management3).

**Unicenter®**

Infrastructure Management Software

**BrightStor®**

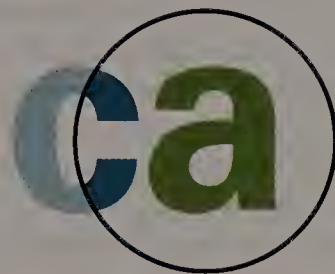
Storage Management Software

**eTrust™**

Security Management Software

**AllFusion™**

Life Cycle Management Software

**Computer Associates®**

# trendlines

the **NEW** the **HOT** the **UNEXPECTED**

Edited by Michael Goldberg

B I O - I . T .

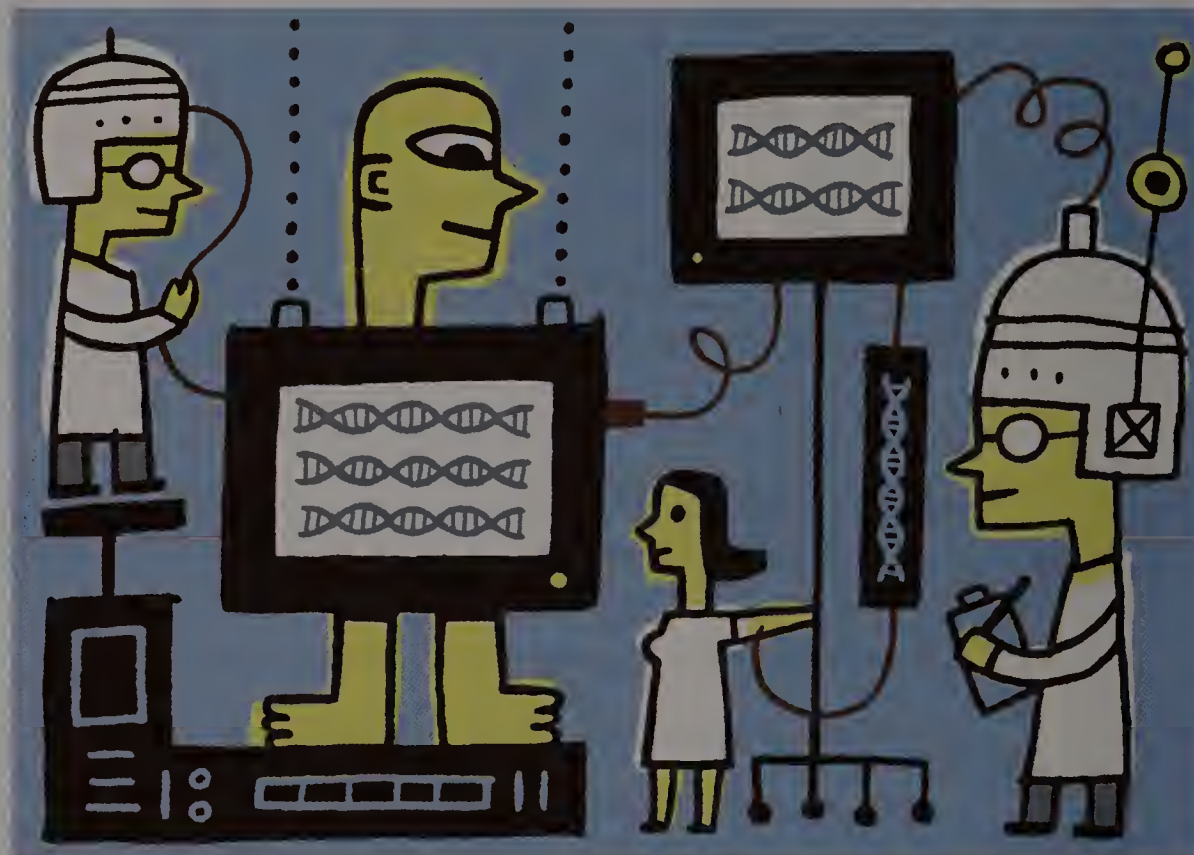
## Technology's Impact on Medicine

**THIS YEAR**, scientists celebrated the 50th anniversary of the discovery of the DNA double helix by finishing the herculean task of deciphering all 3 billion bits of the human genetic code. The human genome project was a technological tour de force that spanned 13 years and cost \$2.7 billion.

The project also is the start of what's expected to be an explosion of data about human biology. An exponentially increasing accumulation of biological data will be the real legacy of the human genome project, says George M. Church, professor of genetics at Harvard Medical School. It wasn't that decoding the genome led to a slew of fundamental discoveries about DNA; there were few, in fact.

But the technological advances and attitude changes fostered by the huge project transformed biology from a slow process of uncovering the facts of life into an information science. "We are becoming information junkies," says Church.

Systems biology is the buzzword for the



information-intensive study of living things. In the past, one researcher might spend three years studying one gene. Now, using technologies pioneered by the human genome project, that same researcher will measure the activity of hundreds of genes in just a few days. In the coming decades, biologists will use large-scale techniques to capture information about the thousands of proteins and other components of living cells, in addition to DNA. With a comprehensive understanding of the molec-

ular networks that control life, some scientists think they will have the key to controlling disease and aging.

The process will cost less in the future too. Experts predict that in 10 years, a full genomic analysis on one person will take an afternoon and cost less than \$1,000.

With data collection going into overdrive, it's hard to imagine what milestone researchers will be celebrating on the 100th birthday of the discovery of the double helix in 2053.

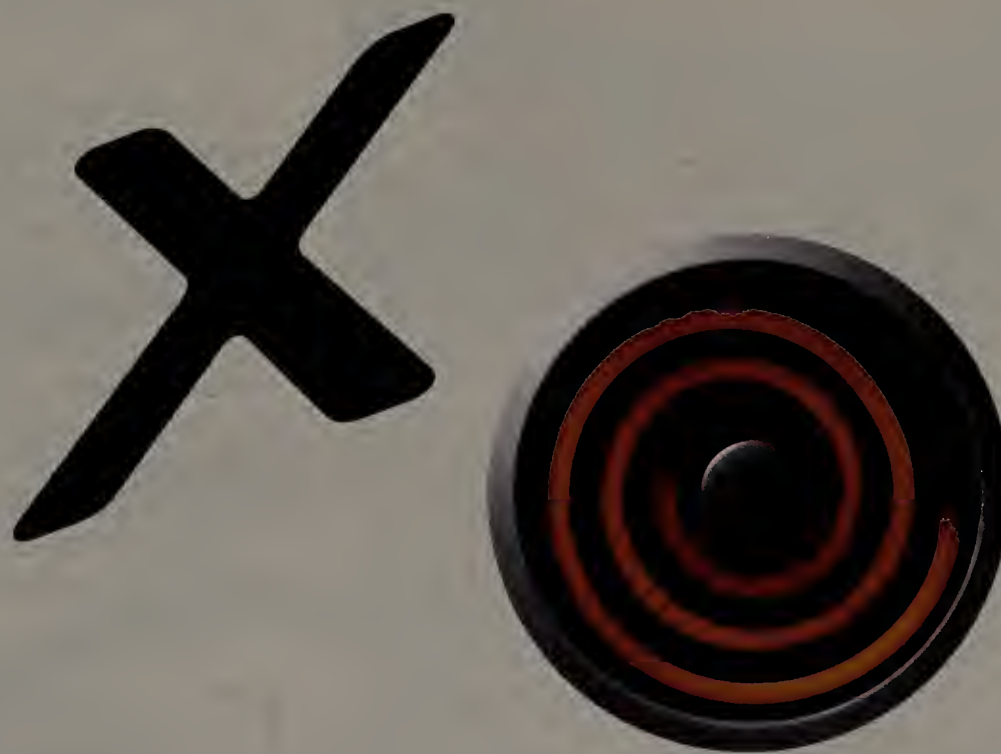
*Continued on Page 14*

### ONLINE DATING

**U.S. consumers spent \$214.3 million on online personals and dating websites through the first half of 2003, three times as much as consumers spent in all of 2001 and more than in any other online content category.**

**An estimated 5.6 million Americans will seek romance online by 2007.**

Sources: Online Publishers Association, comScore, Jupiter Research



It's time to turn up the heat on  
business telecom. On multiple  
carriers. On over-complicated  
contracts. Enter XO Communications.  
Our only business is business,  
whether it's one office or one  
hundred. To do that, we built one  
of the nation's largest Internet  
backbone networks. So you can  
get voice, data, Internet access, Web  
hosting and everything in between.  
On one bill. From one provider.  
And unlike other carriers, with XO™  
Customer Care reps, there are no  
sales pitches. No pressure. Just  
real, live communication with a  
telecommunications company, 24/7.  
What will they think of next?



**CALL TO GET CONNECTED 1-866-SIMPLY XO (746-7599)**

**VOICE\*/DATA/INTERNET ACCESS/WEB HOSTING**

\*Includes international long distance.  
© 2003 XO. All rights reserved. XO and the XO design logo are trademarks of XO Communications, Inc.



DEVELOPING NATIONS

## Can Wireless Lift All Boats?

**IQBAL QUADIR WOULD NOT EXPECT** profit-seekers to look to a poor country like Bangladesh, where the average person earns about \$1 a day in income. But Quadir still sees opportunity. He is founder of GrameenPhone, which has worked with local entrepreneurs to build a cellular phone network and customer base in that Southeast Asian nation.

Quadir asserts that when considered collectively, populations in developing countries represent a valuable customer base, he says. Working in conjunction with micro-lender Grameen Bank, GrameenPhone enables citizens in Bangladesh to open their own small businesses, purchasing phones and reselling the use of those phones to others in their community. Last year, the company generated \$44 million in net income, Quadir says.

Quadir was among a number of executives, academics, entrepreneurs and government officials who gathered at a summer conference at the United Nations in New York City to discuss how wireless technology could aid economic development around the globe and what were the challenges for making that happen. Among the issues they discussed:

**Governments must welcome investment.** Patrick Gelsinger, CTO of Intel, says that Wi-Fi, based on the 802.11 standard, is the cheapest and therefore best technology for bringing broadband wireless to developing nations. However, many of those countries are slow to open up their wireless spectrums to network operators. These governments should set aside spectrum bands with no end-user licensing requirements for wireless device use, as the U.S. Federal Communications Commission has done, Gelsinger says.

**It's better to build smaller networks.** David Jarvis, a representative of the South African Internet service provider UniNet Communications, says his company has found that large-scale commercial services rollouts are impractical. Services need to be offered in smaller chunks that make them easier to implement in developing nations.

**Keep the focus on people and their problems.** Paul Meyer, cofounder of Internet Project Kosovo, an Internet service provider that caters to humanitarian relief groups in that Balkans region, says that international development agencies need to focus not on exciting technologies like Wi-Fi but on solving problems.

"Technology companies are a lot better than international development agencies at building infrastructure," he says. "Everyone here should think less about the networks and standards, and to think more about the problems people really have in the kinds of countries you're talking about. Technology is one little building block as part of the solution."

—Stacy Cowley

## trendlines

### Technology and Medicine

Continued from Page 12

Church believes that in 50 years, doctors will be treating disease by rewriting the genetic code, changing any gene in any cell in the body at will. "You program your computer by sticking in a detailed set of instructions. In that way you micromanage your computer—this is micromanaging your body," he says. Instead of prescribing medicines to control chronic conditions such as high blood pressure, doctors might dispense a sort of genetic tune-up, dialing genes up or down or swapping out DNA parts, to keep you chugging along.

Some scientists are more conservative in their outlook for the next 50 years.

IT turned **biologists**  
into  
**data**  
**junkies.**

Jill P. Mesirov, associate director and chief informatics officer at the Whitehead/MIT Center for Genome Research, says she doesn't believe we will be rewriting our own code, but she does think that we'll have more effective medicines based on extensive analysis of the genes and proteins in individual patients. "In 25 to 50 years, we'll look computationally at molecular profiles of cancer patients and use that to tailor their treatment," she says.

Mesirov envisions knowledge bases where doctors will enter information either through natural language or visual interfaces. After a doctor reports symptoms and the results of lab tests—including genetic and molecular information—the knowledge base will search accumulated data and send back a probable diagnosis and suggested courses of treatment.

But despite all the data, biology will remain inexact. In most cases, genes are not destiny; they only impute probabilities. And Mesirov questions what progress will bring. Will insurance companies refuse to pay for a costly cancer treatment if the patient's chance for survival is only 25 percent? "Whatever happens, the faster we succeed, the greater the ethical issues will be," says Mesirov.

—Pat McCaffrey

Need more network connections?  
Need security and reliability in your infrastructure?  
Need an affordable way to add LAN ports?



Then you need Network Jack from 3Com.

Add ports where and when you need them with Network Jack, a revolutionary, "in the wall" 10/100 switch. Turn a single port LAN wall outlet into four Ethernet ports in just minutes. With Network Jack you avoid the hassle and expense of pulling cables, and it's more physically secure than a desktop switch. Network Jack is available in an unmanaged version, and a managed version which supports port-based VLANs, forwards Power over Ethernet, and features bundled management utilities with patented technology that make troubleshooting a breeze. **With low cost, simple installation, and great features, Network Jack is revolutionizing edge switching technology.** To learn more about Network Jack, visit [www.3com.com/NetworkJack-CIO](http://www.3com.com/NetworkJack-CIO).



"Its unique design enables us to affordably install additional ports in a fraction of the time and cost previously required."

*—Tom Everett, Supervisor of Information Systems,  
General Electric, Lowell, MA*

  
**3COM**  
Possible made practical™

## CHANGE MANAGEMENT

# Success Requires Routine Reinvention

**THE SCENE: A HOTEL BALLROOM STAGE** in New York. Sitting there: Michael Hammer, the guy who put business process reengineering into the corporate playbook; Esther Dyson, IT pundit and capital investor; and Anne Mulcahy, chairman and CEO of Xerox.

The conversation, organized by Xerox as part of an event last spring to showcase the company's wares, yields some familiar insights about the importance of managing people and IT in the context of answering Mulcahy's pressing question: Despite investments in technology, despite every cut you can think of, businesses today are faced with one question—Where is the growth?

## The experts take their turns talking about change.

Hammer emphasizes rethinking the way business works. "Today's customer has an extraordinary degree of power, an unprecedented degree of power because intense competition, virtual commoditization of all products and services. And more information gives the customer greater choice," he says.

"As a result, the customer is flexing this power and demanding extraordinary levels of service, quality, speed and low cost—the only way we can do that is by rethinking end-to-end workflows, business processes."

Dyson stresses the need for humility. "If you change the way you work, it means maybe you were not working right before,

and people hate to admit it," she says. "It's like when a woman gets a haircut...people come up to you and say you look great, and your immediate reaction is, Oh my gosh, how did I look before? Honestly, it's humility that matters. It doesn't mean being ashamed. It doesn't mean thinking you're stupid, but it means understanding that there may be a better way to do it."

surviving manager was the CIO. They have people that used to spend all the day on the phone with customers. Now the customer comes on and uses the website, and they've actually won business for their commodity product simply because they're easier to work with."

Hammer says the opportunities are there after executives "rethink how we work on an



**"If you change the way you work, it means maybe you were not working right before, and people hate to admit it."** —ESTHER DYSON

Both pundits invoke collaborating with customers to deliver what they need. "We're accustomed to think about cost and quality and speed as the basis of competition," Hammer says, "but I think there's an additional one, and that is 'Easy to do business with.'"

## Then they lay out the business cases.

Dyson on International Sugar: "You can't find anything that is more of a commodity [than sugar], and they transformed their business; they came out of bankruptcy, amazingly. The only

end-to-end basis," adding, "This is the domain of process redesign, reengineering, Six Sigma." Among the examples Hammer cites is Shell Lubricants.

The company recently rethought how it starts with an order and turns it into delivery and cash, Hammer says. "In the past, the order-to-cash process would bounce around seven different departments. Now, the order is handled by one person from beginning to end. They've reduced cost by 45 percent; customer satisfaction is up by 105 percent."

—Marc Ferranti



**"The customer is flexing this power and demanding extraordinary levels of service, quality, speed and low cost."** —MICHAEL HAMMER

## ARTIFICIAL INTELLIGENCE

# Robot Reality

**IF, AS THE BOOK SAYS,** men are from Mars and women are from Venus, then the most advanced robots hail from somewhere out by Pluto—at least for now. At an event in May to celebrate the 100th anniversary of MIT's Electrical Engineering and Computer Science Department, scientists talked about the potential for machines that can do much more than assemble cars—if they can clear communications hurdles.

Researchers have made great progress in improving verbal communication between computers and humans, according to several speakers. But a great deal of communication is nonverbal,



says Rodney Brooks, director of MIT's Artificial Intelligence Lab. A robot that can change facial expressions in response to a person's tone and expression means it could staff public information booths or check you into a local hotel.

Brooks's team designed a clown-like robot head with large, pointed ears and huge puppy-dog eyes. Scold it, and it drops its head and pouts. Ears perk up to a question. Praise brings a wide grin.

Not all of the work is in the lab. Outside MIT, Brooks is chairman and CTO of iRobot, which makes the the Roomba automatic floor vacuum. Jokes about dust bunnies and friendly banter are sold separately.

—Tom Krazit

All numbers are estimates from IBM and its customers.  
registered trademarks of International Business Machines Corporation.  
Other company, product and service names may be trademarks or service marks of their respective owners.



# Harry and David **sees it.**

It's on demand business. And it's how Harry and David® reaches the ripest customers. During the holidays, sales spike. That's when Harry and David needs more computing power – enough to move 21,000 Web orders a day. They worked with IBM to create an on demand business model, one that would lower their fixed-cost base. Now when Harry and David needs more power, they lease it. Just for the season. Which allows them to focus on their favorite kind of overhead: those juicy Royal Riviera® Pears. Can you see it? It's on demand business. Get there with @business on demand™



[ibm.com/ondemand](http://ibm.com/ondemand)

# technology's impact on \*every thing

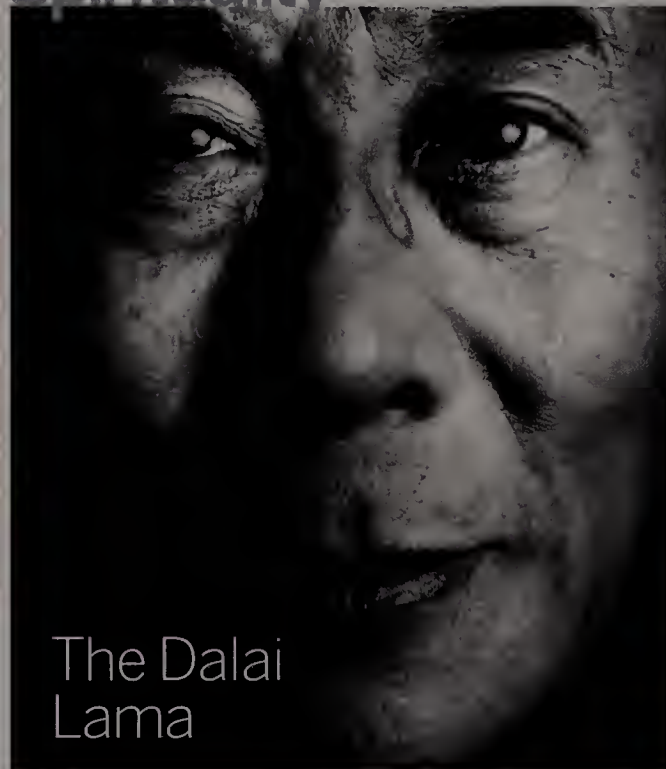
Technology is having a profound impact on the world we inhabit and the ways we conduct our lives, but even the most dramatic changes may seem incremental to those of us who are knee-deep in it. That's why we decided to create this special issue of *CIO*.

## Health Care



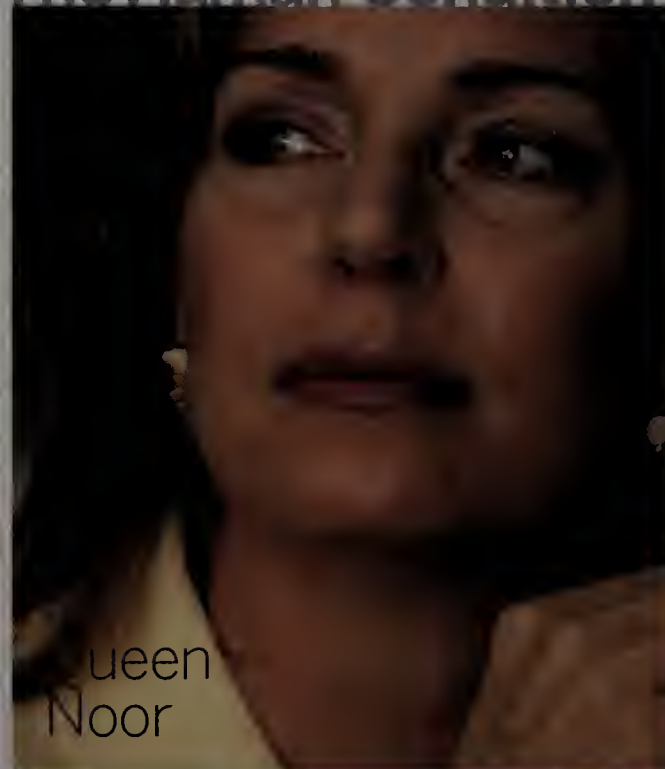
Newt  
Gingrich

## Spirituality



The Dalai  
Lama

## The Human Condition



Queen  
Noor

We invited leading thinkers from many walks of life to share their thoughts about how technology is affecting health care, financial markets, war, exploration, kids, education, employment trends, civil liberties, religion, sports and more. The essays that follow convey a sense of hope and illuminate the frontiers of far-reaching change. They also pose questions that I hope all technologists will take to heart.

Is technology-driven progress good? Do we have a choice to pursue it, or does change have its own built-in inevitability? Can it be controlled (or as Ray Kurzweil puts it in his essay beginning on Page 22, “relinquished”) completely or even selectively? Should we attempt to halt certain developments because the risks are too great, as might be argued with bioengineering or nanotechnology, or simply because they make life less enjoyable, as Ben Crenshaw argues (on Page 46) that golf technology has already done?

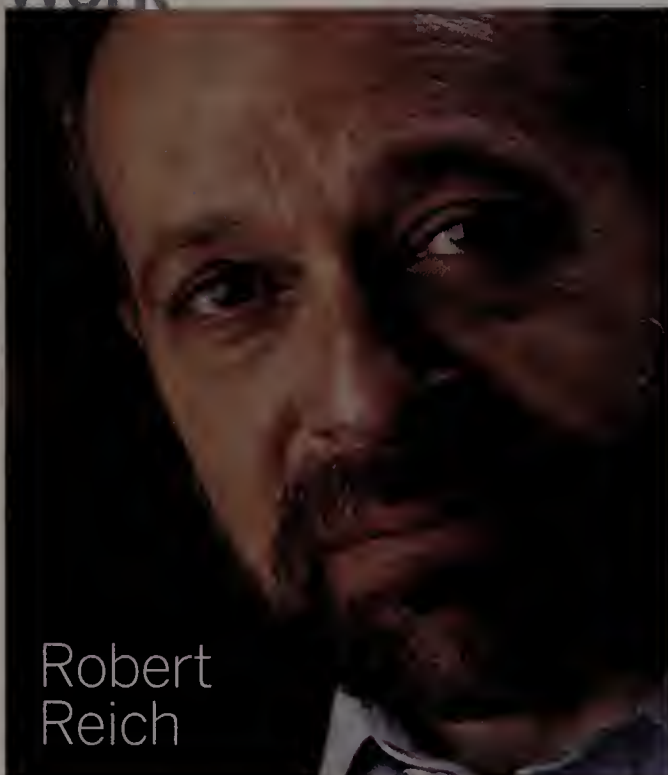
Directly or indirectly, CIOs have a part to play in making many of these changes happen, yet they rarely have an opportunity to step back and consider the long-term effects of their decisions and actions. The reality of work is such that we focus primarily and most intensely on our own piece of the puzzle—our assignments, our department’s goals, the business’s mission, the trends in our industry—and not much more.

With this issue, we invite you to pause and reflect on the broader implications of the work you do. And we invite you to share your thoughts with us and with each other at

[www.cio.com/impact2003](http://www.cio.com/impact2003).

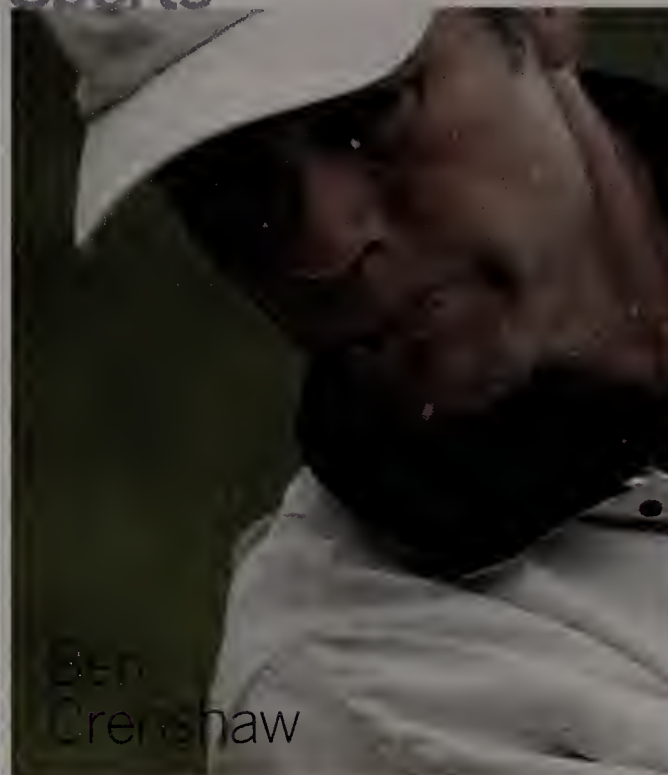
—Abbie Lundberg, Editor in Chief

## Work



Robert  
Reich

## Sports



Ben  
Crenshaw

## plus

**Ray Kurzweil** on the Future  
**Col. Kenneth Allard** on War  
**Robert J. Shiller** on Markets  
**Howard Gardner** on Education  
**David Elkind** on Kids  
**Jonathan Zittrain** on Connections  
**Paul Saffo** on Public Opinion  
**Howard Rheingold** on Power

& more...

**IBM®**



Ming Tsai, IBM business strategist, retail industry

# The waggly bee dance and the responsive enterprise.

Upon arriving back at the hive, a bee with pollen-coated legs does a waggly dance for her fellow bees. The thorax motions are actually a map drawn in the air, entomologists have suggested, indicating both the direction and the distance of the pollen source.

This is the kind of “sense-and-respond” behavior that defines on demand business — the kind that most companies can only dream about.

A sense-and-respond retail environment, for instance, would know every time its best customers entered the store. It would be able to respond to what each valued customer was shopping for that day and suggest appropriate cross- and up-sells. Products would be in stock, promotions would be relevant, sales associates would be experts, checkout would be instantaneous.

This is on demand business, wagging to show you where the money is.

On demand business starts with on demand thinking.

Real people with real insights and the resources to deliver on them.

Partners, listeners, problem solvers. Doers. People to help you evolve your thinking, your business and your culture. It won't happen overnight. It will, however, create real change in your company. On demand business.

Get there with on demand people. Please call 800 IBM 7080 (ask for thinking) or visit **ibm.com**/services/thinking

## Can you see it?

## THE FUTURE

# Ray Kurzweil Promise and Peril of the 21st Century

**TECHNOLOGY HAS ALWAYS BEEN A DOUBLE-EDGED SWORD, EMPOWERING** both our creative and our destructive natures. It has brought us longer and healthier lives, freedom from physical and mental drudgery, and many new creative possibilities. Yet it has also introduced new and salient dangers. Stalin's tanks and Hitler's trains used technology. And we still live today with

sufficient nuclear weapons—not all of which appear to be well accounted for—to end all mammalian life on the planet.

Bioengineering is set to make enormous strides in reversing disease and aging processes. However, the means and knowledge to create unfriendly pathogens more dangerous than nuclear weapons will soon exist in most college bioengineering labs. As technology accelerates toward the full realization of genetic engineer-

Consider unrestrained nanobot replication. Nanobot technology requires the coordinated operation of billions or trillions of intelligent microscopic devices to be useful. The most cost-effective way to scale up to such levels is through self-replication, essentially the same approach used in the biological world. But in the same way that biological self-replication gone awry results in biological destruction (cancer, for example), a defect in the mechanism that safely controls nanobot self-replication would endanger all physical entities, biological or otherwise.

The threats of nanotechnology don't stop there. We must also worry about control and access. Organizations, governments, extremist groups or just a clever individual could create havoc with this technology. For example, one could put trillions of undetectable nanobots in the water or food supply of an individual or an entire

population. These "spy" nanobots could then monitor, influence and even control our thoughts and actions. Existing "good" nanobots could be influenced through software viruses and other hacking techniques. When there is software running in our brains, issues of privacy and security will take on a new urgency.

People often go through three stages in examining the impact of future technology: awe and wonderment at its potential to overcome age-old problems; then a sense of dread at a new set of dangers that accompany the new technology; followed, finally and hopefully, by the realization that the only viable and responsible path is to set a careful course that can realize the benefits while managing the risks.

The diverse GNR technologies are progressing on many fronts and comprise hundreds of small steps forward, each benign in itself. An examination of the underlying trends, which I have studied for the past quarter century, shows that full-blown GNR is inevitable.

Sun Microsystem's Bill Joy has eloquently described the plagues of centuries past and how new self-replicating technologies—such as mutant bioengineered pathogens and nanobots run amok—may bring back long-forgotten pestilence. It is also the case, which Joy acknowledges, that it has been technological advances, such as antibiotics and improved sanitation, that have freed us from the prevalence of such plagues. Suffering in the world continues and demands our steadfast attention. Should we tell the millions of people afflicted with cancer and other devastating conditions that we are canceling the development of all bioengineered treatments because there is a risk that those same technologies may someday be used



### About the Author

» **RAY KURZWEIL** has successfully founded and developed nine businesses in the fields of optical character and speech recognition, music synthesis, reading technology, virtual reality, financial investment, medical simulation and cybernetic art. He is the author of numerous books, including

*The Age of Intelligent Machines*. In 2002, he was inducted into the National Inventors Hall of Fame and received the 1999 National Medal of Technology.

ing, nanotechnology and, ultimately, robotics (collectively known as GNR), we will see the same intertwined potentials: a feast of creativity resulting from human intelligence expanded manyfold, combined with grave new dangers. We need to devise our strategies now to reap the promise while we manage the peril.



## GNR Defined

» **Genetic engineering:** The ability to manipulate DNA-based information processes. Emerging technologies will enable us to block unwanted gene expression, reprogram pathological metabolic pathways, augment the human immune system and even create the equivalent of desirable new genes that we were not born with.

» **Nanotechnology:** Capability to build electronic and mechanical systems molecule-by-molecule and atom-by-atom. The long-term promise of nanotechnology is to manufacture essentially everything from clothes to food using nanoscale “assemblers” and low-cost materials.

» **Robotics:** The long-term goal of artificial intelligence—systems that combine human-level intelligence with the speed and memory capacity of machines.

ment of physical entities that can self-replicate in a natural environment. Another proposal would create what nanotechnologist Ralph Merkle calls a “broadcast architecture,” in which physical entities would have to obtain the codes for self-replication from a centralized secure server, which would guard against undesirable replication.

As responsible technologists, our ethical and professional guidelines should include such fine-grained relinquishment. Other protections will need to include oversight by regulatory bodies, the development of technology-specific “immune” responses, as well as computer-assisted surveillance by law enforcement organizations.

**AS A TEST CASE,** we can take a small measure of comfort from how we have dealt with one recent technological challenge. There exists today a new fully nonbiological self-replicating entity that didn’t exist just a few decades ago: the computer virus. When this form of destructive intruder first appeared, concerns were voiced that as they became more sophisticated, software pathogens had the potential to destroy the computer network medium they live in. Yet the immune system that has evolved in response

for malevolent purposes? Having asked the rhetorical question, I realize that there is a movement to do exactly that, but I think most people would agree that such broad-based relinquishment is not the answer.

I do think that relinquishment at the right level needs to be part of our ethical response to

the dangers of 21st-century technologies. One constructive example of that is the proposed ethical guideline by the Foresight Institute, founded by K. Eric Drexler (creator in the 1980s of the conceptual foundations of molecular manufacturing) and Christine Peterson. It states that nanotechnologists agree to forgo the develop-

to this challenge has been largely effective. Although destructive self-replicating software entities do cause damage occasionally, the injury is but a small fraction of the benefit we receive from the computers and communications links that harbor them. No one would suggest we do away with computers, local area networks and the Internet because of software viruses.

I would describe our response to software pathogens as effective and successful. Although they remain a concern, the danger persists at only a nuisance level. Keep in mind that this success is in an industry in which there is no regulation and no certification for practitioners. And this industry is enormously productive. One could argue that it has contributed more to our technological and economic progress than any other enterprise in human history.

bat the “bad” nanobots). The story of the 21st century has not yet been written, so we cannot say with assurance that we will successfully avoid all misuse. But the surest way to prevent the development of the defensive technologies would be to relinquish the pursuit of knowledge in broad areas. We have been able to largely control harmful software virus replication because the requisite knowledge is widely available to responsible practitioners. Attempts to restrict this knowledge would have created a far less stable situation. Responses to new challenges would have been far slower, and it is likely that the balance would have shifted toward the more destructive applications.

Similarly, GNR technologies cannot be stopped, and broad pursuit of relinquishment will only distract us from the vital task in front of us: to rapidly develop ethical and legal standards and defensive technologies that will be essential

animal models and simulations in lieu of unfeasible human trials. This will be necessary, but we need to go beyond these steps. We must greatly increase our explicit investment in the defensive technologies. Of all the ways we can combat the abuse of technology, this recommendation is by far the most important. In the biotechnology field, this means the rapid development of generalized antiviral medications. We will not have time to develop specific countermeasures for each new challenge that comes along.

**WE ARE AT THE THRESHOLD** of the biotechnology challenge. As nanotechnology comes closer, we will need to invest in the development of defensive technologies for that as well, including the creation of a nanotechnology-based immune system. Bill Joy has pointed out that such an immune system would itself be a danger because of the potential of “autoimmune”

Broad pursuit of relinquishment will only distract us from the vital task in front of us: to rapidly develop ethical and legal standards and defensive technologies that will be essential to our security. This is a race, and there is no alternative.

I hasten to point out that the battle concerning software viruses (and the panoply of other software pathogens) is not over and never will be. We are becoming increasingly reliant on mission-critical software systems (for example, the software running our 911 system, transportation, nuclear power plants, hospitals and many others), and the sophistication and potential destructiveness of self-replicating software weapons will continue to escalate. Nonetheless, we have already managed a number of significant challenges without major damage.

**FUTURE DANGERS** from new technologies may appear alarming when considered in the context of today’s unprepared world. The reality is that the sophistication and power of our defensive technologies and knowledge will grow along with the dangers. When we have “gray goo” (unrestrained nanobot replication), we will also have “blue goo” (“police” nanobots that com-

to our security. This is a race, and there is no alternative.

As we compare the success we have had in controlling engineered software viruses with the coming challenge of controlling engineered biological viruses, we are struck with one noticeable difference. As I noted, the software industry is almost completely unregulated. The same is obviously not true for biotechnology. A bioterrorist does not need to put his “innovations” through the FDA. However, we do require that the scientists developing the defensive technologies follow the existing regulations, which slows down the innovation process at every step. Moreover, under existing regulations and ethical standards, it is impossible to test defenses to bioterrorist agents. There is already extensive discussion to modify these regulations to allow for



reactions (that is, the immune system using its powers to attack the world it is supposed to be defending).

However, this is not a compelling reason to avoid its creation. No one would argue that humans would be better off without an immune system because of the possibility of autoimmune diseases.

Although the immune system can itself be a danger, humans would not last more than a few weeks (barring extraordinary efforts at isolation) without one. The development of an immune system for nanotechnology will happen even without explicit efforts to create one. We have effectively done this with regard to software viruses. This came about not through a formal grand design project but rather through our incremental responses to each new challenge



If I deliver a 1% increase  
in collections I add  
\$1 million to my company's  
bottom line.

## the XML effect

Guido Sacchi, CIO  
CompuCredit

Content Management | Mobile Computing | Web Services | Enterprise Transaction Systems

CompuCredit's robust growth strategy requires on-demand delivery of quality information to more efficiently acquire and manage credit card portfolios.

That's why CIO Guido Sacchi took on the challenge to reduce the time to service new portfolios from months to weeks with the XML Business Gateway.

Imagine delivering to the business user's desktop a single view of information from disparate data sources, risk models and collections applications – right when they need it.

Imagine transforming data locked into complex systems into real intelligence that propels the business forward.

Imagine working with a partner who has over 30 years experience in data management including the early shaping and development of XML.

Guido did. And now both he and CompuCredit are seeing imagination turn to reality.

Discover the XML Effect.

To learn more about Software AG and how the XML effect can help you unlock data assets, visit [www.softwareagusa.com](http://www.softwareagusa.com) today.

 **SOFTWARE AG**  
THE XML COMPANY

# On Your Mark...

Are you ready to reduce power densities in your rack with an efficient, cost-saving power and cooling solution that ensures availability?

## They Are.



**"Our Video on Demand (VOD) servers are air cooled from front to back. The APC racks that house the InfraStruXure™ are also designed to cool from front to back. So the same racks can effectively house our power system and our servers."**

Vince Pombo, Vice President of Engineering  
Rich Flanders, Director of Engineering  
Time Warner Cable.

*More and more IT professionals are changing from legacy systems to a new integrated power and cooling solution.*

**STOP Costly Downtime**  
**See the next page for more.**

Kurzweil, continued

and by developing heuristic algorithms for early detection. We can expect the same thing will happen as challenges from nanotechnology-based dangers emerge. The point for public policy will be to specifically invest in these defensive technologies.

One of the arguments made for restricting development of GNR technologies is that offense is much easier and less expensive than defense, giving an edge to groups and individuals with bad intentions. A powerful illustration of this point can be seen in the thousands of lives lost and tens of billions of dollars of damage caused by a handful of terrorists armed with box cutters

ground development, would create an unstable environment in which the dangerous applications would likely become dominant.

**ONE PROFOUND TREND** already well under way that will provide greater stability is the movement from centralized technologies to distributed ones and from the real world to the virtual world. Centralized technologies involve an aggregation of resources such as people (cities, buildings), energy (nuclear power plants, liquid natural gas and oil tankers, energy pipelines), transportation (airplanes, trains) and other resources subject to disruption and disaster. They also tend to be inefficient, wasteful and harmful to the environment.

These technologies are advancing on hundreds of fronts, rendering relinquishment completely ineffectual as a strategy.

on Sept. 11, 2001. I would agree with that point if the people and resources on the sides of promise and peril were equal. But, clearly, they are not. We have devoted tremendous resources to combating terrorism, compared with vastly smaller resources on the side of destruction. For that reason, we are not witnessing regular repetitions of 9/11. Consider that there are tens of thousands of researchers advancing the "G" technology, whereas the numbers on the destructive side are lower by a factor of thousands. As an example in the nuclear arena, who would have guessed in 1945 that the next half-century would not see a single nuclear weapon (beyond the two dropped on Japan) used in anger? The offsetting factor to the inherent advantage of destructive over defensive technologies is the overwhelming balance of resources devoted to constructive and protective applications compared with malevolent ones.

Although the argument is subtle, I believe that maintaining an open system for incremental scientific and technological progress, in which each step is subject to market acceptance, will provide the most constructive environment for technology to embody widespread human values. Attempts to control these technologies through highly restrictive regulation or in dark government programs, along with inevitable under-

Distributed technologies, on the other hand, tend to be flexible, efficient and relatively benign in their environmental effects. The quintessential distributed technology is the Internet. Despite concerns about viruses, these information-based pathogens are, as I have noted, mere nuisances. The Internet is relatively indestructible. If any hub or channel goes down, the information simply routes around it. The Internet is remarkably resilient, a quality that continues to grow with its exponential growth.

As I mentioned, there are voices arguing for broad-based relinquishment of technology. Bill McKibben, the environmentalist who was one of the first to warn against global warming, takes the position that "environmentalists must now grapple squarely with the idea of a world that has enough wealth and enough technological capability, and should not pursue more." In my view, that position ignores the extensive suffering that remains in the human world, which we will be in a position to alleviate through continued technological progress. Most important, we need to understand that these technologies are advancing on hundreds of fronts, rendering relinquishment completely ineffectual as a strategy. As uncomfortable as it may be, we have no choice but to prepare the defenses. ■

# FREE White paper!

## "Determining Total Cost of Ownership for Data Center and Network Room Infrastructure"

Just mail or fax this completed coupon or contact APC for your FREE white paper, "**Determining Total Cost of Ownership for Data Center and Network Room Infrastructure.**" Also receive our FREE InfraStruXure™ brochure. Better yet, order both today at the APC Web site!

Key Code  
<http://promo.apc.com> m843y  
(888) 289-APCC x2919 • FAX: (401) 788-2797

**APC**  
Legendary Reliability®

# FREE White paper!

## "Determining Total Cost of Ownership for Data Center and Network Room Infrastructure"



- ☐ **YES!** Please send me my FREE white paper and InfraStruXure™ brochure.
- ☐ **NO,** I'm not interested at this time, but please add me to your mailing list.

Name: \_\_\_\_\_ Title: \_\_\_\_\_

Company: \_\_\_\_\_

Address: \_\_\_\_\_ Address 2: \_\_\_\_\_

City/Town: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_ Country: \_\_\_\_\_

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_ E-mail: \_\_\_\_\_

☐ **Yes! Send me more information via e-mail and sign me up for APC PowerNews e-mail newsletter.** Key Code m843y

### What type of availability solution do you need?

- ☐ UPS: 0-16kVA (Single-phase) ☐ UPS: 10-80kVA (3-phase AC) ☐ UPS: 80+ kVA (3-phase AC) ☐ DC Power
- ☐ Network Enclosures and Racks ☐ Precision Air Conditioning ☐ Monitoring and Management ☐ Cables/Wires
- ☐ Mobile Protection ☐ Surge Protection ☐ UPS Upgrade ☐ Don't know

**Purchase timeframe?** ☐ < 1 Month ☐ 1-3 Months ☐ 3-12 Months ☐ 1 Yr. Plus ☐ Don't know

**You are (check 1):** ☐ Home/Home Office ☐ Business (<1000 employees) ☐ Large Corp. (>1000 employees)

☐ Gov't., Education, Public Org. ☐ APC Sellers & Partners

©2003 APC. All trademarks are the property of their owners. ISX3A3EB-US\_2C • E-mail: [esupport@apcc.com](mailto:esupport@apcc.com) • 132 Fairgrounds Road, West Kingston, RI 02892 USA



NO POSTAGE  
NECESSARY  
IF MAILED  
IN THE  
UNITED STATES

**BUSINESS REPLY MAIL**

FIRST-CLASS MAIL PERMIT NO. 36 WEST KINGSTON, RI

POSTAGE WILL BE PAID BY ADDRESSEE



AMERICAN POWER CONVERSION

ATTENTION CRC: m843y  
Department: B  
132 FAIRGROUNDS ROAD  
PO BOX 278  
WEST KINGSTON RI 02892-9920



## How to Contact APC

**Call: (888) 289-APCC**

*use the extension on the  
reverse side*

**Fax: (401) 788-2797**

**Visit:** <http://promo.apc.com>  
*use the key code on the reverse  
side*

**APC**  
Legendary Reliability®

# InfraStruXure™ is the Key to Stronger NCPI

by Russell Senesac

InfraStruXure Product Manager

APC InfraStruXure™ architecture is the industry's new benchmark for on-demand network-critical physical infrastructure (NCPI). The foundation of IT networks, NCPI consists of power, power distribution, racks, cabling, cable distribution, cooling, and cooling distribution. Strong NCPI defends your IT networks against security and availability problems.

Complementing these benefits of strong NCPI is InfraStruXure's open, adaptable, integrated approach, which ensures optimal performance and lower upfront and operating costs. InfraStruXure fully integrates power, cooling, management and services within a rack-optimized design.

## Power

InfraStruXure architecture features rack-optimized, intelligent UPSs and power distribution units that are highly manageable, modular, and pre-engineered to meet the demands of the smallest wiring closet to the largest data center.

## Cooling

Cooling solutions designed for InfraStruXure are extremely flexible, fitting almost any data environment as though custom-made, but without the extensive engineering that traditional cooling systems require.

## Management

InfraStruXure boasts the industry's only fully integrated power management solution. Monitor the elements of your data center, understand how your InfraStruXure is performing and, when necessary, take action remotely to ensure service levels are met—all from a Web browser on your desktop computer. You'll be able to maximize availability through system-level proactive management. InfraStruXure management solutions are easy to use and require little to no training.

## Services

A full menu of professional services, performed by APC Global Services experts, supports your InfraStruXure architecture. Whether building a new installation or retrofitting InfraStruXure into your existing IT environment, a range of services is able to meet your specific needs. Factory-trained professionals commission the elements of your InfraStruXure, understand how it is performing and, when necessary, take action to ensure optimal service levels are met.

## The Result

With InfraStruXure, you get the reliability, affordability and predictability of standard solutions, yet completely customized for your specific problems. As your requirements change, InfraStruXure easily adapts, allowing you to build out or scale back capacity as it is required. ■

**FREE White Paper and InfraStructure™ Brochure**

Visit <http://promo.apc.com> Key Code m843y  
Call 888-289-APCC x2919 • Fax 401-788-2797

# Go!

Are you going to take advantage of this availability solution to prevent costly downtime?

## You Are.

Stop hesitating.

You've been given the green light to ensure the continuous operation of your mission-critical electronic applications.

Go find out more about how InfraStruXure™ can build availability into your business processes.



**InfraStruXure™**

**POWER RACK AIR**

Open, adaptable and integrated architecture for on-demand network-critical physical infrastructure



**FREE** White Paper: "Determining Total Cost of Ownership for Data Center and Network Room Infrastructure" and **FREE** InfraStruXure™ Brochure

To order: Visit <http://promo.apc.com> Key Code m843y  
Call 888-289-APCC x2919 • Fax 401-788-2797

## Go! Find Out More!

**APC®**  
Legendary Reliability®

E-mail: [esupport@apcc.com](mailto:esupport@apcc.com) • 132 Fairgrounds Road, West Kingston, RI 02892 USA  
©2003 American Power Conversion Corporation. All Trademarks are the property of their respective owners. ISX2C3EF-US

# Get Set...

Are you set to save space  
and minimize installation  
and maintenance costs  
with a modular manageable,  
pre-engineered architecture?

## They Are.



*If I had purchased the incumbent vendor's 3-phase upgrade model, I would have paid 75% more in service costs over the next four years and I would have had to utilize 50% more of my precious floor space."*

Captain Timothy Riley  
Support Services Division  
City of Newport Beach Police Department

Many IT professionals have switched from an inflexible proprietary system to network critical physical infrastructure.

## CAUTION

### Be Sure of Your Solution

## MARKETS

# Robert J. Shiller

## New Hope for Old Risks

**IN 2001, IEMPOWER OF NEW YORK CITY CREATED A WEBSITE AND ONLINE** exchange to allow individuals to finance their educations by selling shares in their future incomes to investors. With this remarkable new market, individuals can hedge some of the risks of their human capital investments, and

investors who put such shares in their portfolios can invest in this human capital—that is, participate in the development of labor income. Literally, one can invest in people.

The same year, City Index of London created an online futures market for a U.K. index of home prices. With this new market, homeowners or builders can hedge the risks of their long position in real estate, and investors can add U.K. owner-occupied homes to their portfolios.

In 2002, Goldman Sachs and Deutsche Bank created the Economic Derivatives Market, an

electronic marketplace where financial professionals can trade macroeconomic indicators such as nonfarm payroll and retail sales. This lets people hedge macroeconomic risk—risk that the aggregate economy will fail—and investors can participate in national incomes.

Those innovations represent radical expansions of the scope of our financial markets beyond the traditional realm of Wall Street to cover other risks: career outcomes, the value of homes and national economies. These risks to our ordinary riches really matter, and until now

there have been no substantial financial or insurance institutions to deal with them.

While none of these markets has attracted much public attention, they represent the beginnings of an important trend. Probably the

most important driver of new risk marketplaces is IT, which helps overcome previous barriers.

There should be no surprise in this: Advancing IT helps promote all sorts of activities. But dealing with risks to our homes, our careers and our countries are activities that are especially helped by IT. Dealing in such individual risks—or, in the case of macroeconomic aggregates, the sum of individual risks—requires data on the smallest units of economic activity.

But these markets present new risks that must be managed. Doing this without generating a prohibitive “moral hazard” cost (the economic term for the cost incurred when risk management causes people to be careless about or even welcoming of risks, as when an insured homeowner either neglects the home or deliberately burns it down to collect on the policy) requires extensive surveillance at a fine level.

**CONSIDER RISKS** to individual homes. In the past, some of these have been dealt with by homeowners’ insurance, which has covered losses due to objective, verifiable events, such as fires. Insurance focused on the kinds of risks that could be readily verified given the state of information technology, and for which procedures could reasonably be put in place with that technology to catch much of the moral hazard.

With vast new databases now being developed on home sales, and on activities of homeowners, it should now be possible to extend risk management to a broader list of risks to home values, such as the bursting of a housing bubble or a region’s economic decline. A potential problem with this sort of financial market, however, is the creation of moral hazard problems that are much more severe than the risk that a homeowner will deliberately burn down the house to collect. If homeowners no longer have any worry about maintaining the value of the prop-



### About the Author

» **ROBERT J. SHILLER**, economics professor at Yale University and the Yale School of Management, is widely known for his research on financial markets. He is the author of the recently published book *The New Financial Order: Risk in the 21st Century* and the best-seller *Irrational Exuberance*. Shiller is a fellow of the American Academy of Arts and Sciences.

erty, there are a million different ways for them to neglect it—ways that cannot be dealt with the way arson has been. But IT provides a way out of this fix: Better databases allow us to write risk management contracts against an index of home prices for the neighborhood in which the homeowner lives. Since the risk corresponds to the neighborhood, no moral hazard arises.

By the same token, allowing people to sell shares in their own future careers carries with it potentially enormous moral hazard problems. People whose careers are insured can just not try hard, not make the tough decisions, and not trouble to keep themselves up to date in their fields. In fact, this moral hazard problem has become endemic to social welfare systems in many countries. But this moral hazard can be dealt with by various methods that are well known in the financial community, if new IT brings down the currently high costs of operating them. For example, we can use the expanding databases on individuals to create indexes of incomes for people in particular sets of circumstances. In this way, risk management contracts are tied to indexes rather than to individual incomes. Once again, IT can be used to control a moral hazard.

Methods to hedge the macroeconomic risks that countries face are also subject to moral hazard problems. Most notably, it has been difficult to know if the data reported by governments is always trustworthy. But the rapid expansion of databases and the software to disseminate that information makes our knowledge of national incomes, and any efforts to manipulate them, much higher.

The beginnings of innovative new markets that we have seen in the past couple of years are based on a recognition of the importance of IT. There is real hope that these beginnings will lead to bigger, better new institutions, which will allow coverage of very real risks against which people historically have had no protection. Markets do not become important until the public senses that they are deep and liquid, and that the prices quoted in this market represent substantial opportunities to buy and sell. Depth and liquidity develop slowly during the years, as more and more people acquire the skills and habits to deal in them. New IT has dramatically expanded other financial markets, and I predict it will do this for risk markets as well. ■

## WAR

# Col. Kenneth Allard

## Battlefield Information Advantage

**BECAUSE THE AMERICAN MILITARY DOES NOT BELIEVE IN RE-FIGHTING** the last war in Iraq, it is proceeding with after-action reviews and analyzing lessons learned. But it is not too soon to suggest that Gulf War II will be remembered as a conflict in which information fully took its place as a weapon of war.

Just as the railroad, the telegraph and more accurate battlefield weaponry made the American Civil War the harbinger of industrial age conflict, consider the only more pronounced effects of the information age weapons used during Operation Iraqi Freedom:

- Clusters of unmanned aerial vehicles loitered over the battlefield for hours, providing continuous surveillance and occasionally serving as convenient launch platforms when attractive targets were spotted.
- Complementary groups of aerial surveillance platforms, including aircraft and satellites, were able to pinpoint Iraqi forces in daylight and

darkness—and in weather conditions that included sandstorms of biblical proportion.

- Precise navigation allowed controllers to distinguish American troops, vehicles and logistics from those of the enemy. Armed with this information, pilots programmed an array of precision munitions that hit Iraqi targets with devastating accuracy while largely, though never completely, avoiding collateral damage to civilian facilities and minimizing the ever-present problem of “friendly fire.”
- Networks of satellite communications and tactical data arrays enabled information-sharing quite literally from the foxhole to the Pentagon.

Military services whose lack of interoperability had been proverbial (“We have only the same travel agent in common...” ) now found themselves linked to each other and coalition partners with a pervasive connectivity that allowed everything from the exchange of e-mail and graphics via battlefield laptops



About the Author

» COL. (USA, RET.) KENNETH ALLARD, special assistant to the chief of staff of the Army from 1987 to 1990, is a military analyst with MSNBC and NBC News, and a specialist in intelligence, and command and control. His upcoming book is *Business as War*.



March 2003: IT was a crucial tool in the Iraq War, both on the battlefield and in command and control. Here, Air Force personnel perform last-minute preflight checks on a Predator unmanned vehicle (above). An officer (left) monitors field activity from aboard the *USS Theodore Roosevelt* in the Eastern Mediterranean.

## Allard, continued

to interactive chat room discussions between widely separated command headquarters.

**THE TACTICAL RESULTS** of this information flow could be appreciated in several ways. Iraqi artillery batteries could barely fire before American ground and aerial surveillance spotted and fixed on their positions. The information was immediately passed either by voice or tactical data links to Army ground stations or fighters, setting the stage for devastatingly accurate return fire by rockets or artillery—a “sensor-to-shooter” sequence usually completed within seconds or minutes. Iraqi air defenders quickly learned that to radiate their fire control radars was to invite an immediate audience with the Almighty as U.S. Air Force high-speed anti-radiation missiles almost invariably found their marks. Consequently, the Iraqis mostly fired “in the blind” while their American counterparts usually hit their targets with the first round.

The information differential could also be seen in planning the calculus of battle. The U.S. force assembling to overthrow the Baghdad regime (a far more exacting mission than kicking the Iraqis out of Kuwait) was less than half the size of its Desert Storm predecessor. The reason: During the 12 years between wars, the American military had come to realize that the enemy treated information in the same unimaginative, hierarchical way that characterized its whole approach to battle tactics. It could hardly have been otherwise, since Saddam Hussein constantly shuffled his military commanders—and

periodically executed some of them—in order to ensure that none could threaten his regime.

If the Iraqi military operated in paranoid fashion, with information disseminated on a need-to-know basis (and only Saddam needed to know everything), the American force brought in to destroy it had chosen to use information as its lifeblood—achieving along the way a quantum leap in teamwork and military effectiveness. Much of modern military history consists of the endless quest for a more effective combination of arms—of organizing infantry, armor, artillery and airpower to produce the elusive synergy that is more than the sum of its parts. Problem was, every new capability seemed to square the difficulties of command and control rather than producing the desired synergy.

For the American military, this problem was compounded by the first waves of the information age. Although computers and information technology offered an array of innovative capabilities, each new system was conceived, developed and procured by the same military services—and in many of the same ways—that acquired ships, tanks and airplanes. The result was a problem that most CIOs will recognize. Far from being built in, interoperability was an afterthought, or even an additional expense to be jettisoned whenever funding cuts loomed. Thus, a paradox: Even as computers grew more sophisticated and information synergy more possible, the military services grew further apart. And yet, every time U.S. forces took the field, there was invariably a price to pay for the continuing “seam” of interoperability, such as the notorious “friendly fire” incident in April 1994,

when two Air Force F-15 fighters mistakenly shot down two Army Blackhawk helicopters over northern Iraq, killing 26 people.

As most CIOs will also understand, progress in correcting this anomaly was uneven. But in the 1990s, the Joint Chiefs of Staff and the combatant commanders began to promote a vision of future warfare in which C4ISR (command, control, communications, computers, intelligence, surveillance and reconnaissance) systems would be forged into a new style of American warfare in which interoperability was the key to information dominance—and information dominance the key to victory.

**IT IS DIFFICULT** to see Operation Iraqi Freedom as anything less than a vindication of that ambitious vision. While some analysts—including this one—had worried that a wired battlefield inevitably meant more insidious micromanagement, Gen. Tommy Franks achieved something unique. Like his predecessors, he used information to gain a “God’s-eye view” of the battlefield, but he also insisted that what he knew and could see be shared with his subordinate commanders. Franks then insisted that they use this information to seize and keep the tactical initiative. Far from being a tool of micromanagement, information dominance was used to take risks but not gambles.

There are of course the usual caveats. The Iraqi opposition proved singularly unable to mount a serious challenge to the smooth functioning of American networks, either by hacking, jamming or concerted physical attacks against communications facilities. The next enemy may not be so inept.

Professional signal officers, reservists (normally found in places like Circuit City) and a legion of lower-ranking technicians were required to lash disparate systems together as well as to handle the inevitable challenges posed by heat, sand, dust and constant movement. So there is a subtle compliment to be found in the Army’s new Global Command and Control System, used in Iraq for the first time. Its acronym is GCCS—pronounced “geeks.” Exactly. Can’t live without ’em.

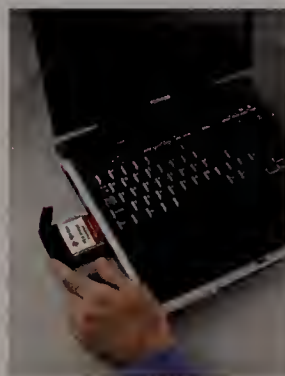
In fact, information dominance—either in business or war—proves the worth of whatever difficulties information managers must undergo to achieve it. For the American military, the verdict on the information weapon parallels the one reached during an earlier age about airpower: Now that we have it, there is simply no way we intend to go to war again without it. ■

AT&T Wireless works.

average  
20–40 Kbps

**Sprint works nearly twice as fast.**

average  
50–70 Kbps



**Your business can get more done, faster, in more places nationwide with the **Sprint** advanced wireless network.**

Compared with the AT&T Wireless Next Generation network, **Sprint** gives you:

- Laptop connections nearly twice as fast
- 30% larger coverage area
- 35 million more people covered

All of this and, of course, clear calls on the most complete, all-digital wireless network in the nation to make your business more effective.



PCS Connection Card.™  
Insert it in a laptop.  
Get a wireless connection.

**Get the facts at [www.sprintpcs.com](http://www.sprintpcs.com) or call 877-459-8144 for a PCS Business Representative.**



**One Sprint. Many Solutions.™**

Voice/Data

PCS Wireless

Internet Services

E-Business Solutions

Managed Services

Speed claims based on published averages from each carrier and other information. Realized speeds will vary based on devices, tasks and other factors. Coverage claims based on the enhanced Sprint Nationwide PCS Network (reaching 240 million people) and the AT&T Wireless National Next Generation (GPRS) network and coverage included with available service plans excluding roaming areas. Copyright ©2003 Sprint Spectrum L.P. All rights reserved. Sprint and the diamond logo are trademarks of Sprint Communications Company L.P.

## THE HUMAN CONDITION

# Queen Noor Women in the Developing World

as told to Elaine M. Cummings

**TECHNOLOGY HAS BECOME A POWERFUL FORCE FOR TRANSFORMING ECONOMIC** life, but it is also having an increasingly powerful impact on social and political conditions around the world. In particular, the Internet has expanded dramatically the reach of nongovernmental organizations and humanitar-

ian activists. Not only are these groups better able to mobilize the masses, but the Internet's instantaneous nature also enables them to more effectively exert pressure and influence decision making at all levels.

In particular, groups of women in different parts of the world are beginning to voice their concerns and expand their influence on critical issues within governments and decision-making bodies that traditionally have not incorporated their perspectives. This is critical to our efforts to combat poverty and hunger and promote sustainable development, conflict prevention and recovery.

While on the one hand it is important to work within political structures in order to elect more women to parliaments and to ensure that they are more present in decision-making bodies, new technologies provide an alternate means by which women can network more effectively and be active participants in the social, political and economic fabric of their societies.

Though the possibilities are enormous, the technology gender gap remains wide. Around the world, the number of women making use of the Internet is relatively small. Only 22 percent of all users in Asia are women; the number in Latin America is about 38 percent. And in the Middle East, only 6 percent of users are women. My

region has both the lowest rate of Internet access for women and the fewest women involved in economic and political life. The challenge and opportunity in the Middle East, then, is to utilize these technologies to accelerate the pace of development. But public and private institutions must have the political will to make the technology available and to properly train women to use it.

Throughout the world, most women using information technology have minimal training.

They lack the skills necessary to become future IT leaders, programmers, software designers and entrepreneurs, and instead are often relegated to low-level jobs, doing little more than data entry. Even in the United States, female representation in mid- to upper-level IT jobs is still quite low. If we can redress this imbalance, we might be able to reduce the conditions of inequity that exist globally on all levels of society and help to promote a more stable, peaceful world.

### About the Author

» **HER MAJESTY QUEEN NOOR OF JORDAN** was born in Washington, D.C., and graduated from Princeton University before marrying King Hussein in 1978, reigning with him until his death in 1999. For 25 years, she has promoted international understanding of the Middle East, Arab-Western relations, interfaith dialogue and humanitarian concerns. She works with Seeds of Peace, which brings together children from Israel and Arab countries in an effort to break down barriers and prejudice; Women Waging Peace; and other international humanitarian organizations. Her recently released book, *Leap of Faith: Memoirs of an Unexpected Life*, is a *New York Times* best-seller.



PHOTO LEFT BY AP/WIDE WORLD PHOTOS; LOWER RIGHT BY NADER/CORBIS SYGMA



Technology education (left) should begin at the elementary school level and continue with more advanced IT training programs, which can and should adopt strategies to attract more women.



Selling handicrafts (below) over the Web has generated sustainable income for rural Jordanian women even when violence and conflict in the region has killed the tourism industry.

the rights of women and children are all fundamentally interrelated, and that they need integrated solutions.

In one particular initiative, we focused on the needs of women in rural Bedouin communities, providing them with training and access to microcredit for handicraft production. In this case, they specialized in weaving projects, making rugs out of readily available raw materials in both traditional and contemporary designs. We developed a marketing strategy that

we will see these young women begin to expand their own thinking about their roles in society, what opportunities exist for them, and what they hope to accomplish. We have to be ready to provide them with the skills and the training to make the most of that greater vision.

Whether in industrialized or developing countries, science and technology education has not been as popular among girls as boys. That has to change. It should begin at the elementary school level, incorporating computers at an early age and encouraging girls to study science and math. And it should continue with more advanced IT training programs, which can and should adopt strategies to attract more women. Carnegie Mellon University saw a dramatic increase in the enrollment of women in its computer science programs when it integrated socially relevant subjects into the science and technology curriculum. I hope other universities will follow suit.

If more universities, companies, international institutions and certainly governments focus on these issues—not just getting the technology and the equipment, but actually looking at how they can be used by women in particular and by rural communities in general—it could have a dramatic impact on the quality of life for entire societies in the developing world. I have seen it happen. ■

Let's take the Middle East. Sadly, the recent "Arab Human Development Report" notes that more than half the women in the Middle East are illiterate. In addition, a significant proportion of women in the region live in rural areas, and most technology is concentrated in the cities among high-income groups and more privileged classes. The programs being developed to change that are going to take some time. But there is great potential.

Since 1985, the development initiatives of the Noor Al Hussein Foundation have concentrated in this area as a complement to the Jordanian government's economic plans. We realized that problems of poverty, unemployment, health, education, the environment, and

included selling these unique handicrafts over the Web, generating sustainable income for these women even when violence and conflict in our region has completely killed the tourism industry. As a result, these women have been able to achieve self-reliance and begin assuming significant economic, social and even political roles in their communities.

With every successful model, we not only develop replicable programs, but we also have an impact on the next generation of girls. These girls see dramatic changes taking place in their families as a result of their mothers' work: the contributions they are making to the national economy and how they connect to the global economy. It is still early, but in a few years I think

Elaine M. Cummings, managing editor of *CSO*, has served as a top editor at both *CIO* and *Darwin* magazines.



## THE ENVIRONMENT

# Bjorn Lomborg What's Natural

**IT IS CERTAINLY TRUE THAT TECHNOLOGY IS TRANSFORMING OUR NATURAL environment.** But this fact should only be lamented if one is willing to renounce the very base of civilization itself.

Technological advances are the concrete manifestations of our continuous struggle to escape our natural environment, which started more than 20,000 years ago with the containment of fire and the first stone tools. For our ancestors, the natural environment was synonymous with a relentless fight for survival and reproduction. But technological advances spurred by our species' intellectual capacity made it possible to shift some of our limited resources to other activities. Put simply, technology has allowed us to live better and longer lives. The past 50 years have brought about an unprecedented increase in the welfare of humankind, propelled by technology.

### About the Author

» **BJORN LOMBORG** is director of Denmark's national Environmental Assessment Institute and an associate professor of statistics at the University of Aarhus. He authored the controversial book *The Skeptical Environmentalist*. The World Economic Forum named him a Global Leader for Tomorrow. And *Business Week* listed him among "50 stars of Europe."

There is no point in denying that technology has changed our natural environment and will continue to do so. Yet few people, I believe, would be willing to sacrifice the huge benefits that this ancient cumulative process has created.

The more interesting question is how technology can be applied not to bring us back to some utopian natural state but to help us balance humankind and the nature that we wish to preserve.

With ecologists focusing on the terrible consequences of technological development (arguably being responsible for million of deaths) on one side and with technology opportunists on the other, the debate can easily become polarized. It

has proved to be easy to find ample evidence of either the very harmful consequences of technological advances or their huge beneficial effects. That is why it is extremely important to focus on the environmental fundamentals.

**SO WHAT** do fundamental measures of environmental quality tell us about the consequences of technological progress? The biggest lesson is that technological progress and human ingenuity seem to explain the apparent paradox of continued progress in human welfare in a world of finite resources. The demand for and the availability of the earth's resources adjust over time, according to developments in technology. That is why the world has yet to run out of a vital resource. In fact, the availability of many vital resources actually increases with technological progress and economic efficiency.

For example, with improving technology we are capable of locating and exploiting ever-lower-quality iron ore at ever-cheaper costs, thereby leaving us with more and more years of future consumption at higher and higher levels. Likewise, the world's known oil reserves have increased significantly in modern times, despite a considerable rise in energy consumption, as we have become better at extracting and exploiting oil. The incredible advance in agricultural productivity means that there is much less need to convert pristine areas into cropland. It has been estimated that if all farmers around the world reach the average yield of today's U.S. corn growers, only half of current cropland will be needed to feed 10 billion people at today's level of calories in America.

The demand for natural resources also changes as substitution becomes possible. In telecommunications, the demand for copper has dropped as copper wires are replaced with abundantly available silicon fibers. In other cases, technological progress spurs a demand for alternative resources. The demand for wind energy has only recently advanced beyond sailboat skippers to become a viable commercial source for energy. There are many small, everyday examples of material substitution: lead in batteries is being replaced with lithium; plastic dental fillings are often preferred over silver ones; car frames are increasingly based on carbon or glass fiber materials; and with the advent of digital photography, demand for silver is ever declining.

The main reason why the infamous "Limits to Growth" reports (written by Donella Mead-

# BECAUSE YOUR INFORMATION IS NOT A COMMODITY.



## THE NEW SYMMETRIX DMX

**EMC<sup>2</sup>**  
where information lives

The world's leading information storage system just got better. Introducing the enhanced Symmetrix<sup>®</sup> DMX. New high-end and entry-level options. The industry's best non-disruptive capabilities. The ability to replicate more data, more cost-effectively — across the room or across the ocean. Rapid innovation from EMC, where information lives.

[EMC.com/dmx](http://EMC.com/dmx) 1.866.symm.dmx/1.866.796.6369



The Symmetrix DMX Series

EMC<sup>2</sup>, EMC, and Symmetrix are registered trademarks and Direct Matrix Architecture and where information lives are trademarks of EMC Corporation. All other trademarks used herein are the property of their respective owners. © 2003 EMC Corporation. All rights reserved.

ows, et al., in 1972 and 1992) got their dire predictions of an imminent world collapse so wrong was because they overlooked the fundamental dynamics of technological progress. Modern societies create a great deal of value without much environmental degradation, as economic welfare has come to rely more on how a material is processed and utilized than on the material itself.

This is not to say that technological progress does not cause problems for the environment. Technology might in some cases transform the surrounding environment in ways that were neither anticipated nor wanted. Until recently, our main worries concerned ever-increasing levels of air pollution. However, the evidence shows that as income rises beyond a certain point, concentrations of major air pollutants dramatically decrease *despite* an increase in energy consumption. Even more important, technological advances seem to drive down major pollutants over time in all countries, whatever the levels of national income.

Still, the technology-based western world is energy-intensive, and one of today's challenges is global warming caused by the emission of carbon dioxide. The question is whether the best way to address the problem is through political restrictions or technology R&D. The path chosen with the Kyoto protocol (which the Bush administration refused to endorse) is mainly one of political restrictions: an expensive solution that will produce a negligible impact on the climate 100 years from now. In my view, it would be more fruitful to divert resources to increased research and development in more efficient forms of carbon dioxide energy.

The trend toward less carbon dioxide per unit of energy started long before there were any talks of global warming, with the move from coal to oil to natural gas. In the past 20 years, that has gathered momentum. Overall energy efficiency has increased, and significant advances have been made in renewable energy.

As for many environmental challenges, technological progress can be said to constitute both the root cause and the solution. But from a broad perspective, technology really is the only game in town. ■

## WORK

# Robert Reich Jobless in America

**I.T. EMPLOYMENT IS DOWN 20 PERCENT SINCE EARLY 2001. SALARIES ARE down too.** In 2000, senior software engineers earned up to \$130,000. The same job now pays no more than \$100,000. In 2000, entry-level computer help desk staffers earned about \$55,000; now, \$35,000.

The main reason is the lousy economy. First came the loud pop of the high-tech bubble, then 9/11, then corporate fraud. Since the start of 2001, 2.6 million private-sector jobs have disappeared in America. It's been the longest job-market downturn since the Great Depression.

Add in productivity gains that have been growing much faster than the economy, especially in technology sectors, and you've got even less need for labor. Machines can do more. The enormous productivity gains brought on by IT itself has, ironically, reduced the need for many midlevel project managers. Economic output has expanded at an annual rate of 2.7 percent since the fourth quarter of 2001. During the same period, worker productivity (output per hour of work) has expanded at a rate of 4.2 percent. That gap between economic output and productivity is the widest yet. Until growth catches up with productivity gains, don't expect a lot of jobs to return.

But there's a third reason: the trend toward the global outsourcing of IT. This year, more than half of all Fortune 500 companies are outsourcing some software development. It's estimated that by 2005, more than 80 percent of such companies will join the trend. American financial services companies expect to transfer half a million jobs—9 percent of financial services employment—to foreign nations during the next five years. U.S. technology companies now pay foreign organizations \$10 billion a year to handle

data entry, analysis, customer service and computer programming.

**DON'T GET ME WRONG.** Global outsourcing is a small factor relative to the bad economy and the productivity gains wrought by automation. The number of IT jobs sent abroad still accounts for a tiny proportion of America's 10-million-strong IT workforce. But there's no doubt that the trend is gathering steam.

The reason is that foreigners can do a lot of IT jobs just as well and much more cheaply than they can be done in the United States. The starting salary of a software engineer in India is around \$5,000. Experienced engineers get between \$10,000 to \$15,000. Top IT professionals might earn up to \$20,000.

Their numbers are growing. India, where the bulk of foreign IT jobs are, already has 520,000 IT professionals. It's adding 2 million college graduates a year, many of whom are attracted to the burgeoning IT sector.

Meanwhile, it's become far easier to coordinate such work from headquarters in America. Overseas cable costs have fallen 80 percent since 1999. With digitization and high-speed data networks, an Indian office park can seem right next door.

A study by Forrester Research estimates that by 2015, some 3.3 million more American white-collar jobs will shift from the United States to low-cost countries, mostly to India.

### About the Author

» **ROBERT B. REICH**, former U.S. Secretary of Labor during the Clinton administration, is the Maurice Hexter Professor of Social and Economic Policy at Brandeis University, and author of *The Future of Success*.



Robert Reich says the U.S. government should not try to block efforts by American companies to outsource jobs offshore.

A black and white photograph of a man in a suit standing in a field, looking up at a large, dark umbrella that covers him. The umbrella is held by a thin pole. The background shows a flat landscape with some trees in the distance under a cloudy sky.

**WHAT EVERY CEO, CFO AND CIO  
NEEDS TO KNOW ABOUT CYA.**



Global Business and IT Consultants  
[ams.com](http://ams.com)

## Reich, continued

Underlying the trend toward foreign outsourcing of IT is the reality of tough global competition and a sagging domestic economy. Both are putting immense pressure on American companies to reduce costs. That's why more and more organizations are buying rather than making, and outsourcing has become the name of the game. And as salaries account for about 70 percent of most companies' expenses, the cost-cutting has been concentrated on payrolls.

In the old way of thinking, employees were an investment just like factories or equipment. Adding workers was a major expense, and cutting them was a decision not taken lightly. Today, most employees are seen as units to be stockpiled or shed as business warrants. Technology not only allows fewer people to do the jobs of many; it also allows their skills to be taught to anyone, quickly, anywhere around the world. Hence, most companies have started to think of wages as variable rather than fixed costs.

This is good news for consumers. Prices are low. Inflation has become a nonissue. The cost of many technology goods continues to drop.

But it's not necessarily good news for American workers, especially high-tech employees who used to be shielded from the direct effects of global competition. Manufacturing workers have been losing jobs to low-cost foreign workers for years. Low-skilled service workers, like call-center operators, were the next to lose jobs to low-cost foreigners. Now, it's professional and technical workers' turn.

**IN THE SHORT TERM**, when the U.S. economy bounces back from recession—as it surely will within the next 18 months—we can expect many IT jobs to return. But given the long-term trend in foreign outsourcing, what's to stop all IT work from moving abroad, eventually?

Three things.

First the risk. Outsourcing—especially to a country 10,000 miles away—increases the possibilities of loss or theft of intellectual property, sabotage, cyberterrorism, abuse by hackers and organized crime. Not much of this has happened yet. But as more IT is shipped abroad, the risks escalate. Smart companies will keep their most important functions in-house, at home.

Second is quality control. The more complex the job order and specs, the more difficult it is to get it exactly right over large distances with subcontractors from a different culture. In a recent

Gartner survey of 900 big U.S. companies that outsource IT work offshore, a majority complained of difficulty in communicating and meeting deadlines. So it's unlikely that the most complex engineering and design can be more efficiently done abroad.

Third is the competitive pressure for continuous innovation. Even as they ship out “commodity” IT work overseas—including software maintenance and support, and even infrastructure support—the best companies are simultaneously shifting their in-house IT employees to more innovative, higher value-added functions, such as invention, integration, key R&D and basic architecture. Companies need to continuously nurture these core creative activities, which are at the heart of their competitive futures.

All this means that, despite the long-term trend toward outsourcing IT jobs, there will continue to be plenty of IT work in the United States in years to come.

The U.S. government should not try to protect or preserve IT jobs in America, or block efforts by American companies to outsource. That would only put American companies at a competitive disadvantage. Their rivals in other advanced economies would continue to have access to low-cost IT services from developing nations.

The best approach is to ensure that American schools and universities continue to provide the best problem-solving education anywhere in the world, so that we continue to generate IT managers and programmers who are creative and adaptive. American companies will also need to invest more in developing the skills of their IT workers, which requires more than just training in the latest computer language. Millions of people around the world can and will learn the necessary computer language.

In order to justify their high salaries, America's future IT workers will need to be more like management consultants, strategists and troubleshooters. They'll need an intimate understanding of the business so that they can devise new IT solutions. They'll help decide which IT work can most efficiently be outsourced; and they'll be liaisons between the work that goes offshore, the work that's subcontracted to other companies in the United States and the IT work done in-house.

The transition will not be entirely smooth. But if we handle it right, American organizations will be stronger and more competitive, and American IT professionals will have rewarding opportunities for years to come. ■

At AMS, we know a lot about technology.

Even better, we know a lot about the

businesses we work with. For more than

30 years, we've helped government

agencies, telecommunications firms, and

financial services firms achieve high-

performance results. How? Not by acting

like someone in our industry, but by

thinking like someone in theirs.

**IT+IQ=Results™**

**ams®**

Global Business and IT Consultants  
ams.com

## EDUCATION

# Linda Abarbanel & Howard Gardner Teaching Our Children Well

**IN SPITE OF NEW MEANS FOR ACCESSING AND SHARING INFORMATION,** today's classrooms still reflect 19th century approaches to teaching and learning. For the most part, with the exception of early childhood education, teachers lecture and write lessons on blackboards while students memorize information and fill in multiple-choice bubbles on tests.

The ascendance of the computer and the appearance of global information networks, however, are likely to bring about educational change in many parts of the world and may even force change in the test-crazed United States. The rise of information economies and concomitant changes in the nature of work call for a different set of skills than was previously acceptable. Just-the-facts educational agendas that stress memorization are no longer viable. Schools need to teach students how to learn, ask good questions and make judgments in complex and often ambiguous cases.

Quality educational software, properly implemented, can help students grasp difficult-to-learn concepts, redefining our expectations of what children can do. Software provides learners of all styles and needs with a virtual toolkit for accessing information with much greater efficacy than predigital resources. For example, secondary school students can readily graph mathematical equations and manipulate variables to observe how they behave. Younger children can play with geometrical figures, rotating and transforming them to discover unexpected patterns that they can then try to describe and explain. With multimedia and hypermedia software, students and teachers can create exciting, interactive presentations that

engage a learner through multiple senses.

Textbooks will be supplemented or even replaced by virtual reality and computer simulations that will allow for even more hands-on explorations of concepts. Children will be able to explore ideas and test out hypotheses on anything from plate tectonics and evolutionary theory to the spread of viruses, the fall of markets and the onset of political revolutions. In the future, commerce in ideas—at school, in business and in the professions—will no doubt require such facility with manipulating and conveying information through different forms of representation.

**THE INTERNET** also promises to redefine the very nature of the classroom. Distance learning already offers sufficiently motivated students flexibility and control in advancing their skills and credentials, breaking the mold of the traditional schoolhouse. In the future, even mainstream classrooms will incorporate large portions of online instruction. In the class "Cognitive Development, Education and the Brain," which we teach at the Harvard Graduate School of Education, we have replaced our live "talking heads" with several dozen online video lectures that students can access and watch at their leisure. Students pause during lectures to take notes, repeat

important or challenging sections, and return for viewing as often as they like. This opportunity is especially valuable for our international students for whom English is a second language, and those with learning problems. These lectures run the gamut: from visiting experts and interviews with noted scholars to introductions to the nervous system, learning pathologies and major theoretical ideas. Future generations will be able to listen to the great thinkers, leaders and creators of our time. Imagine being able to watch Einstein lecture on physics or Socrates discuss philosophy. These electronic archives don't have to be hoarded by the wealthiest universities but can be shared with even the least affluent institutions in our country and abroad.

Of course, no one is advocating that technology should or can replace the very necessary human component of the learning process. Kids need to work with other kids and learn from real human beings, especially admirable role models. However, rather than isolate students (as many have feared), computers can be used to

### About the Authors

» **HOWARD GARDNER** is a professor in cognition and education at the Harvard University Graduate School of Education. The author of 18 books, Gardner is best known for his theory of multiple intelligences.

» **LINDA ABARBANEL** is a doctoral candidate in human development and psychology at the school.

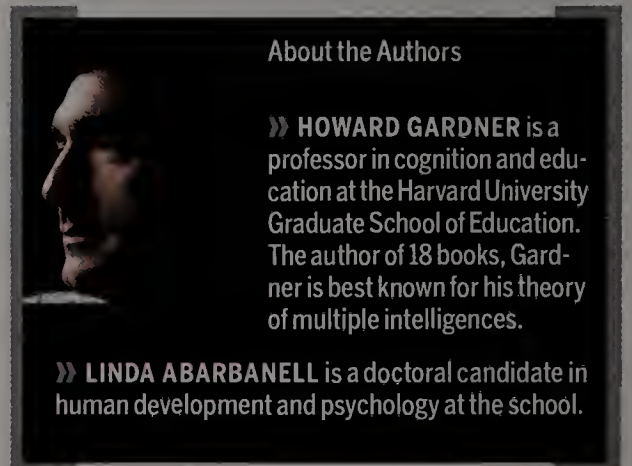




ILLUSTRATION BY MICHAEL MORGENSTERN

bring students together. For example, children with physical and emotional disabilities can often work on computers with ease, collaborating with nondisabled peers in mainstream classrooms and accomplishing goals that were previously inaccessible. Software that encourages exploration, inquiry and problem-solving can actually serve as catalysts for social interaction and cooperation: Engaged students talk excitedly as they discuss and build on one another's ideas. On the other hand, "drill-and-kill" software may only encourage competition and turn-taking. Much will depend on the choice of technology and how it is used. Technology is not a panacea—it is a tool like any other in the classroom.

Another commonly voiced concern about technology in education is that an inequitable distribution will result in a "digital divide" between rich and poor. As technology becomes

more affordable and accessible, however, the gap between haves and have-nots will shift to a deeper divide, between those who know how to use a computer more judiciously and pointedly, and those who merely use it to shop and play games. The critical variable is not who has the costliest and most cutting-edge equipment, but rather which schools are better able to apply the equipment they do have around learning agendas that matter.

**TECHNOLOGY-DRIVEN CHANGE** in education is unlikely to happen quickly. Excepting limited pockets of experimentation, education is an inherently conservative institution. This tendency is only exacerbated by society's current focus on standards and high-stakes assessments, which place greater demands on educators and students without necessarily understanding or providing the means to achieve the sought-for

ends. Only when the current text-and-test strategies prove both fruitless and costly will the way be open for meaningful reforms—and legislators in some states are already lowering the cutoff marks for passing the new tests rather than meeting with the harsh penalties of failure. New technologies will then exert their influence, once it is demonstrated that they improve performance on things that matter.

To accelerate the promise of educational technology and mitigate potential risks, educators, policy-makers and technologists need to talk. A quick look at countries that seem to educate successfully will reveal that what matters is not the quantity of technology but rather the uses to which technology is put. For example, in Japan, a technology-oriented country, there is little use of computers in the early years. That is because Japanese educators recognize how important the emotional and social aspects of education are in the first years of school.

The real issue is how shrewdly technology is used. Currently, the United States probably uses more technology in education than

many other countries. But the often cosmetic application of computers to poorly designed goals and rigid assessments—while it may raise test scores slightly—is only undermining the love of learning and the development of genuine understanding.

Long ago, the invention of written language caused a revolution in education, changing both the way people thought about learning and the tools they had for making learning possible. Today, new information technologies should be doing the same. The future will not belong to those with the largest collections of facts but to those who understand how to use concepts, reasoning and imagination to spark novel insights and generate new knowledge. And honor will be conferred on those teaching entities—both human and electronic—that are most successful in producing lifelong learners and contributors to knowledge. ■

# CIO|04 Annual Meeting

Issues ▶ Ideas ▶ Impact

What are our vulnerabilities?

What are our options?

A **hard** look ahead at the impact  
of current issues & trends.

What are our opportunities?

What are our peers doing?

November 2-4, 2003 | JW Marriott Desert Ridge Resort & Spa, Phoenix, AZ | 800.366.0246

**CIO|04** is a forward-looking conference that will bring together CIOs from leading companies to discuss the major trends that will have significant impact on the CIO role over the next 12-24 month timeframe. We will explore how to share approaches to managing the future of the CIO role.

Presented by



The Resource for  
Information Executives

Sponsored by



**CIO|04**—a CIO Perspectives® Conference | [www.cio.com/conferences](http://www.cio.com/conferences) | 800.366.0246

In order to ensure a true peer group experience, attendees must meet CIO Executive Programs' qualifications.

# The Changing Face of Technology

## A Look into the Future

**W**hen I joined CXO Media in 1996, I kept a "Technology Journal." Every day I challenged myself to learn two new technology terms—ERP and CRM one day, for example, HTML and UNIX another—and by the end of six months I was relatively fluent in the lingua franca IT.

I recalled this journal as I sifted through the visionary statements you're about to read. These pieces, articulated by some of today's top technology leaders, are populated by some interesting terms of their own.

"Enhancing customer satisfaction."

"Gaining competitive advantage."

"Increasing revenue."

Haven't times changed? In the mid-90s the talk was all about implementing arcane new technologies. Now it's about driving business value. Or as one visionary says, "Technology, by itself, is not the answer, but it is the facilitator to help America and the economy grow."

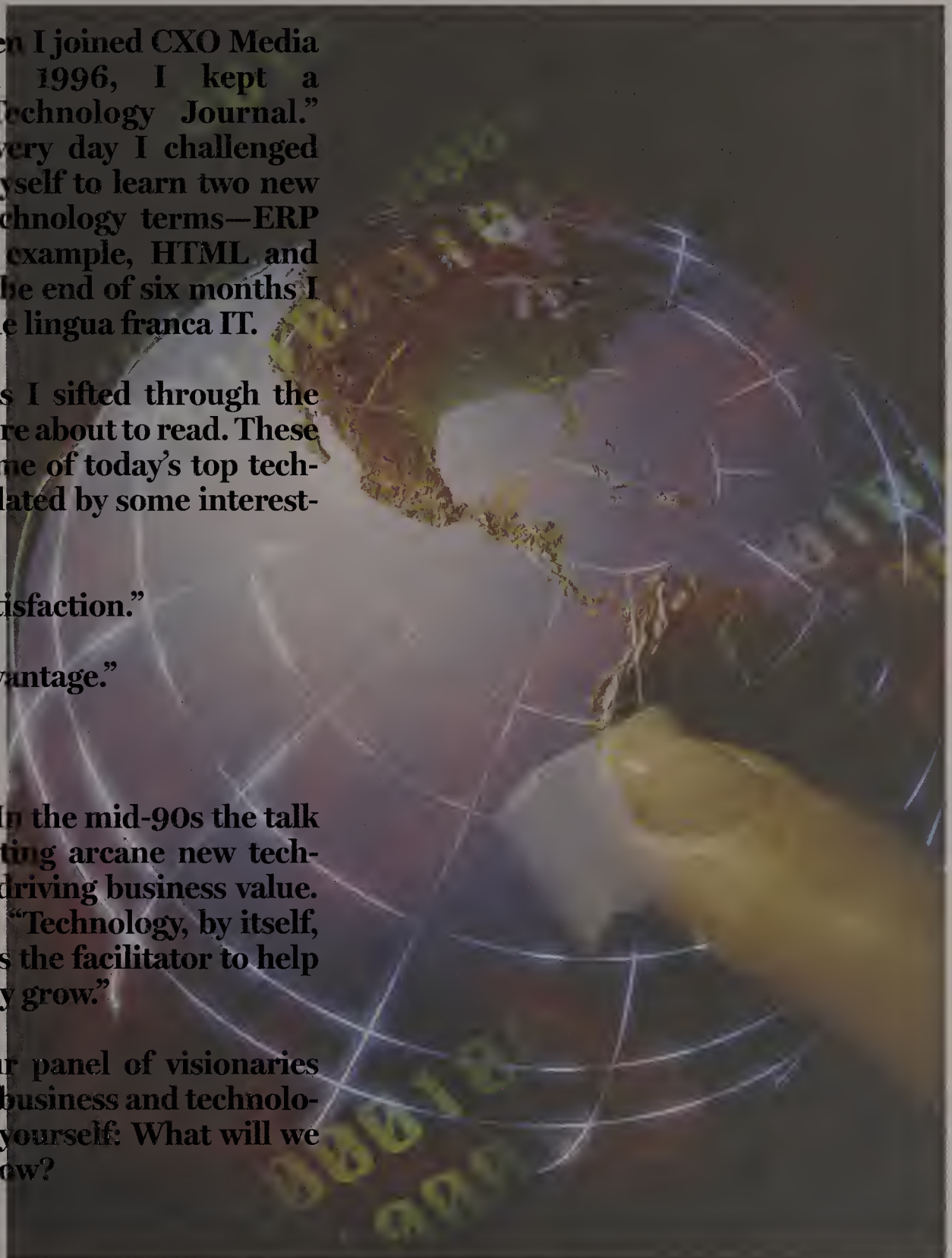
Read on to see what our panel of visionaries projects for the future of business and technology. And as you read, ask yourself: What will we envision a decade from now?

—Tom Field



Custom Publishing

Advertising Supplement



## Innovating Without Escalating Costs

### How a Simple Technology Does More With Less

**A**lan Greenspan mentions productivity in almost every speech. Corporate profits trend upwards, even when revenues decline. Yet American corporations are trimming resources. What's going on?

The US Federal Reserve Bank, as well as progressive Dow Jones leaders, answer with one word—technology. And those familiar with technology point to the benefits of software integration based on open standards.

Today, businesses demand applications and integration based on open technologies and standards because they want to squeeze more productivity from their existing Information Technology (IT) systems by reusing applications and reducing overhead costs.

Software AG recently helped the New York City Department of Buildings put its entire construction document database online. Architects, engineers and other professionals now use the Web to retrieve code, occupancy and safety information for more than 900,000 buildings under the city's jurisdiction. That's increased productivity!

From an open standards perspective, XML (eXtensible Markup Language) helps organizations align their business and IT requirements, resulting in innovation without escalating

costs. XML operates across platforms, languages and applications and enables organizations to exchange and process information with artful simplicity and speed.

Many organizations now receive measurable results in improved cash flows, reduced sourcing costs and instant reporting using XML. Some companies have expanded into new markets by using XML-based storage to access data previously locked inside proprietary systems.

This is not a sales pitch for the software industry. And, technology, by itself, is not the answer, but it is the facilitator to help America and the economy grow.

Take a good look at how your software systems interact and how much time your users and IT staffs spend moving data from one system to another. You'll find plenty of opportunities to break counter-productive patterns and refocus on value-driven activities.



**Gary Voight**  
**President and CEO, Software AG**

**software AG**  
THE XML COMPANY

## Addressing the Communications Dilemma

**A**lthough recent advances in technology have brought many benefits and marvels, they have also caused CIOs many sleepless nights. And now with employees more mobile and using advanced communications tools, most enterprises are struggling with the question: How do you keep workers productive and connected while balancing investments in these technologies?

Ironically, as technology has blurred the line between our business and personal lives, our communications remain overwhelmingly fragmented and isolated. The solution to this communications dilemma requires a new and fundamentally different approach. To address this, Siemens is creating second generation IP (2gIP) solutions to unleash the full potential of advanced IP-based applica-

tions and transform the way we communicate.

Siemens 2gIP solutions, which can be deployed across any environment—headquarters, branch offices, remote workers, or as a hosted solution—deliver a unified user experience with consistent access to the information and applications workers need, when they need it.

One application that exemplifies the power of 2gIP is Siemens OpenScape. An SIP-based, open collaboration application, OpenScape operates on any voice communications platform or as a stand-alone solution. It blends presence-

based capabilities across a multi-resource environment, providing users with consolidated access to all enterprise communication resources—voice features and services, e-mail, instant messaging (IM), and multi-resource collab-

oration. OpenScape provides an entirely new and previously unthinkable level of freedom, flexibility, simplicity and control.

With OpenScape and our other 2gIP solutions, Siemens aims to lift the artificial boundaries imposed by today's many and diverse communications technologies, so people can be more productive in their business lives and more fulfilled in their personal lives.



**Joseph G. Licata**  
**President, Siemens Enterprise Networks**

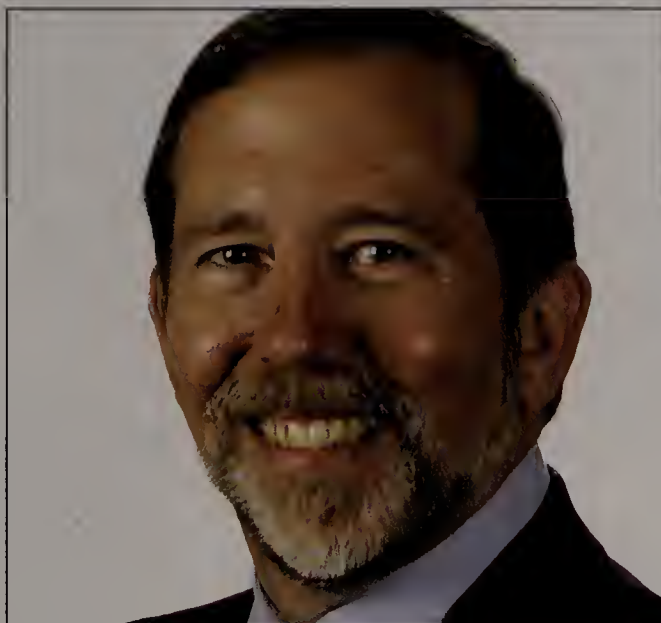
**SIEMENS**

## Innovation in Challenging Times

As the articles in this issue make so very clear, information technology continues to advance in new and exciting ways—creating real opportunities to improve our business operations. The challenge for many CIOs, however, is keeping up with these advances while facing a myriad of daily challenges—from budget pressure, outsourcing, and vendor consolidation to the performance of complex projects.

While CIOs wrestle with operating in this tactical environment, Moore's and Guilder's Laws keep changing the economics of IT—and innovators continue to develop new solutions. So how can CIOs spot opportunities in the midst of their crushing day-to-day demands?

One answer that's worked for AMS is to dedicate a small group to examine and



**Wick Keating**  
CTO, AMS

evaluate the economics and capabilities of emerging IT from a business perspective. This group, which includes technologists along with individuals with expertise in the relevant business process, rigorously assesses potential business impacts—costs, service improvements, and so on. By

keeping a tight focus on technologies that can have major, positive benefits on the organization, CIOs can stay on top of key developments.

Small experiments and scenario testing are relatively inexpensive ways to determine how technology can be applied on a larger scale. Involving business unit stakeholders helps ensure that the focus on business value is maintained and that the work is seen as "real world" and adding value, not "ivory tower" and a waste of resources.

*Wick Keating is CTO for AMS ([www.ams.com/innovation](http://www.ams.com/innovation)), a global business and IT consulting firm. With over 25 years experience in all aspects of information systems, Keating supervises the AMS Center for Advanced Technologies (AMSCAT), which is responsible for exploring the latest IT solutions and assisting AMS customers with the application of advanced technology.*

## The Next Big Thing in Storage



**Mark Lewis**  
Executive VP, Open  
Software Operations, EMC

The next big thing in storage will be information lifecycle management. Emerging technologies will help IT managers migrate data dynamically to optimized storage platforms—throughout the information lifecycle, from creation and active use to archive and disposal.

The end result is the ability to control the costs of capacity growth, backup procedures that create more copies than necessary, recovery times that take too long and all the archive and retention issues around compliance with new regulations.

Three other trends will drive information lifecycle management: new options for online storage, the emergence of grid/blade computing and the proliferation of storage networking.

The falling costs of disk technologies are making disk replication and backup-to-disk more attractive options. For example, ATA drives now enable more affordable online storage with response times measured in milliseconds, compared to seconds or much longer for tape silos. Next, an entirely new model—content addressed storage—offers a cost effective online archive for information that never changes once created.

A major growth driver for servers will come through bladed computing, bladed Linux, and a lot of Windows blades. With potentially thousands of bladed servers, it's inconceivable that each one will control its own storage.

Information lifecycle management will build on the deployment of networked storage and advances in storage management software. Over time, much of the infra-

structure software that's now in the server device driver stack—file system, the volume management, the pathing—will move into the storage network.

Ultimately, this means the storage infrastructure layer will become more important and more flexible in helping IT managers assign value to their information, classify data, consolidate resources and repurpose assets to meet tomorrow's business objectives.

**EMC<sup>2</sup>**  
where information lives

## Winning With Wireless



**Len Lauer**

**President, Sprint PCS Division**

**W**e live in a world where information is the name of the game, and speed and access to information separates winners from losers. Fortunately, winning has never been easier. With the advent of third-generation networks, higher data speeds, more robust applications, and smart devices with increased processing power, the time is ripe to leverage existing investments and wirelessly extend business-critical applications, e-mail and the Internet to mobile employees.

By leveraging the power of the enhanced Sprint Nationwide PCS Network as part of a PCS Clear Wireless Workplace solution, businesses are increasing productivity, reducing costs, enhancing customer satisfaction and gaining a competitive advantage. Take, for example, the beverage distributor using wireless devices and cards to transmit orders and retrieve inventory records at the customer site, a trucking company using embedded wireless modems to scan and transfer information to alert service centers of arrivals and shipment contents, and an IT consulting firm using smart devices to access email and its customer database to provide better customer service.

The newest wireless products and services are also helping create efficiencies and simplify business processes. For example, the PCS Phone by Hitachi SH-G1000—the first ever to combine a Pocket PC, built-in keyboard, mobile phone and integrated camera—eliminates the need for employees to carry multiple devices. With an eye towards innovation, Sprint offers a diverse lineup of converged PDA devices featuring Windows and Palm Operating system, allowing employees to effectively take care of business while away from the office.

In short, wireless technology has had, and will continue to have, a tangible impact on the way we do business, allowing workers in a multitude of industries to turn downtime into productive time and stay ahead of the game.



**Bruce Claflin**

**CEO, 3Com**

## Changing Business Demands to Drive Technological Changes for Years to Come

**F**rom executive offices to wiring closets and to service providers, the future of network communications technology will profoundly affect the strategic planning, business operations and network infrastructures of businesses worldwide. The "business drivers" that networking will continue to address are: (1) dramatically lowering costs by improving productivity, and (2) increasing revenue by delivering applications and services that enhance your customers' ability and preference to do business with you.

Networks of the future will be very different from today, in terms of reliability, availability, scalability, functionality and cost. Dramatic improvements in technologies will result in networks that are pervasive—i.e. connections that are numbered in the billions, running all forms of media, including voice, video, data and fax. They will be accessed by a wide variety of devices both via wired and wireless connections. And "users" will not only be people, but machines of all types from automobiles to vending machines, most of which will be connected to networks from their suppliers and owners.

Businesses will need to optimize their networks to support new types of users and their changing demands. Reducing costs, improving service and increasing the value of business assets are demands that will drive major changes in business for years to come. The technologies that become mainstream will ultimately be the ones that offer the most practical and measurable benefits to businesses worldwide.

From a vendor standpoint, continued innovations in technology will be essential to success. But these technologies must also be integrated into proven solutions, backed by world-class service and support. And they must provide exceptional value both in the benefits they deliver and their cost to buy and own.



## Be Prepared for the Next Blackout

In light of recent blackout and power conditions, now more than ever CIOs are faced with the task of designing their company's infrastructure to withstand an extended power outage and other power anomalies. By expanding on a building block approach, American Power Conversion (APC) has looked beyond the power to the data center and identified both the problems solved and the incredible efficiencies gained by integrating the rack, cooling, power, management, and services into one scalable architecture.

As a leading provider of end-to-end AC and DC-based back-up power products and services, APC has pioneered open, adaptable and integrated solutions that redefine how Network Critical Physical Infrastructure (NCPI) is implemented.

InfraStruXure closes the gap between advancements in IT technology and its supporting power and cooling requirements. Paralleling the streamlining of IT systems, InfraStruXure is power and cooling architecture made up of modular, highly manageable, pre-engineered components, providing a seamless and secure foundation upon which to build your

entire IT environment.

InfraStruXure enables IT managers to select a variety of standardized components to create a customized solution. This approach provides the reliability, affordability and predictability of standardized solutions, yet is completely customized to solve specific problems. The architecture also allows additional capacity to be purchased and installed only when needed thereby limiting waste.

As power conditions continue to be an issue for IT management, vendors are going to have to supply their customers with products that will give them the availability they require. Allowing them to buy, as they need, giving them the ability to adapt to change and to maximize their efficiency while minimizing their installation, operating, service and maintenance costs.



**Rodger Dowdell**  
CEO, APC

**APC**  
Legendary Reliability®



**Carl J. Grivner**  
CEO, XO Communications

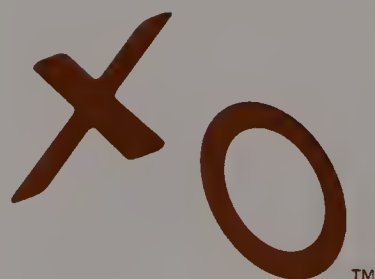
## A Window on the Future of Technology

The past decade has been a period of remarkable innovation—one whose fingerprint will no doubt serve as the benchmark for future ingenuity. If the experiences of today have taught us anything at all, it is that when we combine our best minds with our most powerful technological solutions, we can conquer the ills that plague the human condition. Yet as significant and as far reaching as our recent accomplishments, a glimpse at tomorrow is even more promising.

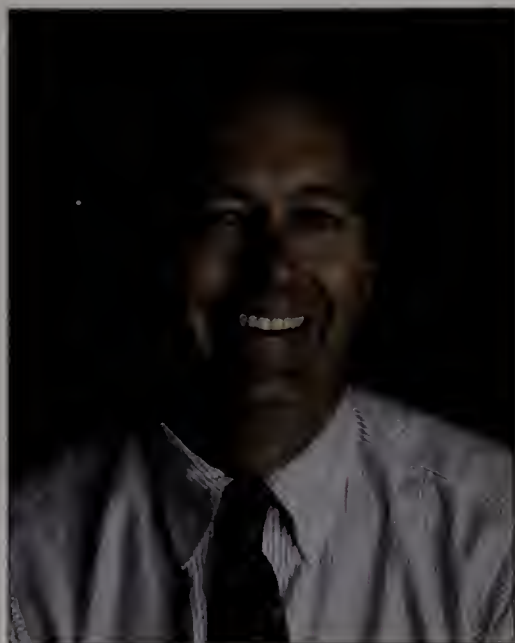
Whether it's connecting leading surgeons around the world with legions of medical residents at the best universities throughout the globe or delivering voice and wire services to villages isolated from modernity, technology deployed to advance our collective daily lives will continue to serve as the nucleus of activity.

Business demands will continue to grow. As a result, engineers will continue to create, test and launch new technologies that will move us forward while challenging everything we once thought we knew. Business requirements will influence individual need although consumer preferences will dictate the overall direction of product development.

Heading into the future, we have a new opportunity to explore smarter and faster solutions. In addition, innovators have a chance to provide greater access to technology so that exposure isn't limited to the privileged but open for all to participate. Business, academia and government will collaborate on new initiatives to create a future that is rooted in fusing technology with humanity.



# Low Icebergs



**George Colony**  
CEO, Forrester Research

For years Forrester has researched high-performance IT—what made some companies great users of technology and others mediocre. Factor No. 1 of high performance was mastery—smart, motivated people in IT who were well-led and well-organized. The second factor was high standardization. Think of corporate IT as an iceberg, with the standardized technology below the water line and the non-standardized above it. The best CIOs are always jumping up and down on top of the

IT iceberg to get it lower in the water—to get more technology fully standardized within their company.

Low icebergs have two effects: decreased cost and higher flexibility. It's more expensive to maintain different types of infrastructure. Implementing, maintaining, customizing, and supporting three financial systems take more resources than handling one. A standard IT infrastructure also knocks down barriers within companies (no zoo of email programs!) and enables divisions or lines of business to reorganize and collaborate without worrying about tech impediments.

Low icebergs require fanaticism. In high-performing companies, you find the same wiring closet designs in Madrid, Tokyo, Atlanta, and Toronto. The CIO forces decisions on servers, operating systems, PCs, networks, CRM, and email systems and makes them worldwide standards—in the face of user objections and political fallout.

Below the water line, massive standardization and commoditization is the mantra. PCs, storage, basic network links, single-application servers, and basic Linux are headed toward coal land. Smart users go to the dominant, market-leading vendor and buy based on good price and good service. Below the water line, IT doesn't matter.

The biggest payoff of low icebergs is that IT resources are freed up to focus above the water line where it is snowing—where new technology is emerging. These technologies are not yet standardized but are ready for application in business. This is the stuff of tangible differentiation and advantage. High-performing CIOs don't wake up worrying about which server to buy; they are fixated on how to use the "above the water line" tech to nail the competition.

There's a blizzard above the water line. The current crop of game-changing technology includes Organic IT, executable Internet, adaptive supply networks, Web services, and physical-to-digital systems like radio frequency ID (RFID) chips. There are no standards yet. There is no Dell or Cisco or Oracle. There is no commodity pricing. There are no services guys who can quickly replicate your competitor's cool system. Above the water line, IT matters a lot.

1983 FORRESTER 2003

Helping Business Thrive on Technology Change

## Company Directory

**AMS-** AMS is a premier business and IT consulting firm to the government, financial services, and communications industries around the globe. AMS specializes in enterprise resource planning, credit risk management, customer relationship management, and enterprise security. [www.ams.com](http://www.ams.com)

**APC-** Founded in 1981, APC is a leading provider of global, end-to-end AC and DC-based back-up power products and services, which include surge suppressors, uninterruptible power supplies (UPS), power conditioning equipment, power management software, and DC power systems as well as precision cooling equipment, and professional and consulting services for Nonstop Networking™. [www.apc.com](http://www.apc.com)

**EMC-** EMC is the world leader in information storage systems, software, networks, and services. The only company fully dedicated to providing automated networked storage solutions, EMC helps organizations of all sizes across the globe to better and more cost-effectively manage, protect, and share their information. [www.emc.com](http://www.emc.com)

**Forrester Research-** Forrester Research identifies and analyzes trends in technology and their impact on business, and provides companies with practical ideas, rigorous research, and objective guidance to help them thrive on technology change. [www.forrester.com](http://www.forrester.com)

**Siemens-** With a wide array of products, systems and services, Siemens is a world leader in information and communications, automation and control, power, medical solutions, transportation and lighting. [www.siemens.com](http://www.siemens.com)

**Software AG-** Software AG is a major supplier of enterprise software for electronic business, Web services, content management, business integration and enterprise transaction processing. Software AG's products control the central IT processes of thousands of renowned companies worldwide to include Lufthansa, Siemens, Citibank, Merck, DaimlerChrysler, Sony, BP and Telefónica. [www.softwareag.com](http://www.softwareag.com)

**Sprint-** Sprint is a global integrated communications provider serving more than 26

million customers in over 100 countries. Sprint is widely recognized for developing, engineering and deploying state-of-the-art network technologies, and provides local voice and data services in 18 states and operates the largest 100-percent digital, nationwide PCS wireless network in the United States. [www.sprint.com](http://www.sprint.com)

**3Com-** Today, under the leadership of President and CEO Bruce Claflin, 3Com redefines the way networks are built and is well positioned to lead the industry through a challenging economy. 3Com is focused on offering innovative, feature-rich products and solutions that excel at low cost of acquisition and ownership. [www.3com.com](http://www.3com.com)

**XO Communications-** XO Communications is a full-service provider of communications services for small & growing businesses, larger enterprises and carriers. XO™ possesses a wealth of local fiber, DSL, fixed wireless, data networking, Internet and long-haul network assets that few - if any - U.S. emerging service providers can match. [www.xo.com](http://www.xo.com)

## WHERE

JW Marriott Desert Ridge  
Resort & Spa, Phoenix, AZ

## WHEN

November 2-4, 2003

## TO APPLY

[www.cio.com/conferences](http://www.cio.com/conferences)  
or 800.366.0246



### Conference Moderator JONATHAN ZITTRAIN

Co-Director of the Berkman Center for  
Internet & Society and Professor at  
Harvard Law School

### The Economy

What's the outlook? What domestic and foreign  
policies are helping or hurting? And what about  
the hard-hit tech sector?

### Jobs & IT People

What happens when all the baby boomers start  
retiring? Does the younger generation really look  
at work differently? Why is there so little diversity  
in the IT ranks? Is offshore outsourcing leading to  
the extinction of most domestic IT jobs? Are our  
schools adequately preparing the next generation  
of IT and business workers?

### Law & Society

How are CIOs coping with the Patriot Acts,  
Sarbanes-Oxley, HIPAA, and other legal man-  
dates? What pending legislation is bound to  
give you headaches if it passes into law? How

much security and privacy is enough? Is all the  
talk about ethics just that? Social responsibility:  
can business do well by also doing good  
—and do your customers care?

### Technology

How worried should you be about vendor consoli-  
dation? What are the major cross-industry busi-  
ness concerns—and what solutions/initiatives are  
getting funded in the near term? Should you fear  
the RFIDs in your future? What emerging tech-  
nologies are venture capitalists betting their  
money on now—and why?

### Future of IT (& the CIO)

For many years, CIOs have been working hard to  
secure a place at the top management table. Now  
some business and industry gurus say IT is no  
longer strategic: it's just becoming a commodity  
and can't give a competitive advantage. Are they  
right? Should CIOs be worried?

And we'll give you plenty of networking opportunities, starting  
with the CIO Golf Tournament on Sunday morning, receptions,  
special small working groups and breakouts, realtimes,  
discussion roundtables, and evening hospitalities.

### Participants include:

**Todd Dagres**  
General Partner,  
Battery Ventures

**Christopher J. Feola**  
Vice President, Technology,  
Belo Interactive

**Neil Gershenfeld**  
Director of the Center for  
Bits and Atoms, and  
Director of the Things  
That Think Research  
Consortium,  
MIT Media Labs

**Asiff Hirji**  
Executive Vice President &  
CIO, Ameritrade Holding  
Corporation

**Michael W. Horrigan**  
Assistant Commissioner,  
Bureau of Labor Statistics

**Bruce P. Keller**  
Partner,  
Debevoise & Plimpton

**Erik Lassila**  
Partner,  
Clearstone Ventures

**Christopher Lindquist**  
Technology Editor,  
CIO Magazine

**Abbie Lundberg**  
Editor in Chief,  
CIO Magazine

**Roger McNamee**  
Co-founder & General  
Partner, Integral Capital  
Partners

**Mark Polansky**  
Managing Director, IT  
Practice,  
Korn/Ferry International

**Sheleen Quish**  
Global CIO & Vice President  
of Corporate Marketing,  
United States Can Company

**Nick Sturiale**  
Partner, Sevin Rosen Funds

**Lester Thurow**  
Author & Management and  
Economics Professor, MIT

## Golf Tournament is on Sunday morning at the course is

- JAKE SHOULD COME — HE'D MAKE LOTS  
OF HELPFUL CONTACTS —
- TALK TO ABBIE L. ABOUT FUTURE ARTICLE?
- SET MEETING FOR PHOENIX OFFICE AFTER
- TELL JACKIE SHE SHOULD MEET POLANSKY!

## KIDS

# David Elkind

## The Reality of Virtual Stress

**THERE IS CONSIDERABLE DISAGREEMENT AMONG EXPERTS REGARDING** the effects of technology on child growth and development. Some regard technology as advancing intellectual development. Others worry that technology may overstimulate and actually impair brain functioning. One of

the problems is that most researchers have taken too narrow a focus on the issue. They have looked at the impact of a particular technology rather than at the technological environment as a whole. One might argue that taken as an aggregate, technologies such as computers, television and cell phones create a digital culture that has to be looked upon in its entirety rather than piecemeal. The question becomes: What is it like growing up in a high-tech world, and how does that differ from growing up at an earlier time? Part of the answer lies in the fact that the digital youth has a greater facility with technology than

getting faster. Online, we get impatient if it takes more than a second or two to get a response from a site hundreds, maybe thousands, of miles away.

Second, it is a screen culture. The movie screen has been followed by the television screen, which became a computer screen, and is now downsized to a cell phone screen. Today, young people spend a large portion of their waking hours in front of one or another screen.

Third, it is an information culture. In their homes, children and youth now have as immediate access to information as do the most erudite scholars in the world's best libraries. Science, literature, history, drama and the arts are all at their fingertips.

Finally, it is a communication culture. The Internet and cell phone have made communication with peers an instant—and at all times possible—connection.

Growing up in this technological culture affects the language and concepts that children learn, and shapes their perceptions of reality. Terms like *cyberspace*, *Internet*, *DVD*, *VCR* and so on all refer to digital realities unknown to children of even the previous generation. The language, music and dress of teenagers all speak to their lack of respect for the older generation and their need to have clearly delineated generational boundaries. Independence from parents and adults means greater dependence on peers for advice, guidance and support. The availability of cell phones and immediate access to friends through instant messaging has only exaggerated this trend and quite possibly worsened the divide between children and their parents.

**DIGITAL CHILDREN** also have a different comprehension of space than did children of even 30 years ago. Virtual realities are such that children and youth can check out new books, games and toys; explore college campuses; and make bets on sports teams, all while sitting in front of their computers. The virtual spaces of many computer games are extraordinarily intricate. The ability to explore and create spaces digitally, without going anywhere, keeps many young people at the computer and almost certainly contributes to obesity among the younger generation.

Children's sense of time has changed as well. The speed of digital communication allows us to be more productive than ever. Perhaps that is one of the reasons we seem to believe we can accomplish more in the time we have than we did in the past. Young children may not only attend day care or after-school programs, they may also be on two teams in one season such as soccer and T-ball, or gymnastics and another sport. School-age children are burdened with even more commitments and homework starting with the early grades.

Indeed, the focus on speed has contributed to education being seen as a race. Many parents erroneously believe that the earlier they start a child on academics, the earlier and the better he'll finish. At the same time, because we now have so many ways to communicate—e-mail, cell phones and IM—we feel busier, and more harried. Young people incorporate this sense of urgency and too often feel guilty about taking time off to play.

The high-tech culture has also changed children's social relationships. Before the digital culture predominated, there was a language and lore of childhood that was orally passed down from generation to generation. They consisted of games, riddles, rhymes, jibes and so on that were adapted to the child's immediate environment.



their parents and other adults. As a result, there is a greater disconnect between parents and children today, and some adolescents have even less respect for the knowledge, skills and values of their elders than they did a generation ago (hard as that may be to believe).

Digital children evidence other worrisome traits, but first, let's explore the culture itself. It is certainly a speed-dominated culture—fast and



While many teenagers are sophisticated users of technology, they remain as naive as preceding generations about the human condition.

Some were universal, like the superstitions ("Step on a crack, break your mother's back") or incantations like "Rain, rain go away, come again another day." Others were imported like "London Bridge Is Falling Down." The culture of childhood made it easy for a child to become part of a group. All she had to do was learn the language and lore. Such play rituals were passed down in the city streets and in country glens. They were intergenerational and made it easier for parents and children to connect.

This traditional culture of childhood is fast disappearing. In the past two decades alone, according to several studies, children have lost 12 hours of free time a week, and eight of those lost hours were once spent in unstructured play and outdoor pastimes. In part, that is a function of the digital culture, which provides so many adult-created toys, games and amusements. Game Boys and other electronic games are so addictive they dissuade children from enjoying the traditional games. Yet spontaneous play allows children to use their imaginations, make and break rules, and socialize with each other to a greater extent than when they play digital games. While research shows that video games may improve visual motor coordination and dexterity, there is no evidence that it improves higher level intellectual functioning. Digital children have fewer opportunities to nurture their autonomy and originality than those engaged in free play.

**IN MANY WAYS**, then, digital children have a far different sense of reality than previous generations. This digital reality is extraordinarily rich and complex. Yet children are still children in many respects. Though they may be sophisticated about technology, they still love a good story told at their level. The success of the *Harry Potter* books attests to this truism. And while many contemporary teenagers are sophisticated users of all forms of technology, they remain as naive as preceding generations about the human condition. Young people today, like those of earlier generations, harbor mythical ideas about sexual behavior; many still believe you will not get pregnant if you do it standing up.

For all of those reasons, it is more incumbent than ever that parents continue to reach out and connect with their children. At a deeper level, our young still very much want and need the love, support and guidance of their parents. Even digital children and adolescents need a hug. ■

## SPORTS

# Ben Crenshaw

## Too Much of a Good Thing

as told to Jerry Gregoire

**GOLF IS AN OLD GAME, MORE THAN 500 YEARS OLD, IN FACT. DURING THAT** time, it's seen a lot of changes in the balls we use and the implements we hit them with. Not all that long ago, golf was played with hickory shaft clubs and a stitched leather ball tightly packed with goose feathers, known as the feath-

erie. Prior to, say, 20 or 30 years ago, the most important technological changes in the game were the introduction of the metal shaft and the rubber core ball. But now, thanks to technological advances in materials and design, players can arm themselves with balls and clubs that are changing the game fundamentally—in ways that are not necessarily good.

Consider the question of whether golfers on the tour today are better than golfers of the past. The numbers—like John Daly's distances off the tee or Tiger Woods' amazing string of course records—might lead one to believe that they are. But in my opinion, the individuals who set records in the past—the Sam Sneads, Ben Hogans, Byron Nelsons—would, given their mental disciplines, skills and temperaments, get them around the course even better than today's golfers. I'm sure of it.

**THERE ARE A LOT** of people, myself included, who believe it's time to call a halt to the technological advances in the game. As a matter of fact, we may have already gone too far. Consider the modern golf ball. Today, it's not all that unusual for players to carry the ball 300 yards off the tee, an amazing distance compared with just eight years ago, when the average drive on the tour was 266 yards. This is not due to the greater strength or skill of today's players. It's simply due to advances in the technology: the improved dimple patterns on balls (which make them more aerodynamic in flight) and the trampoline

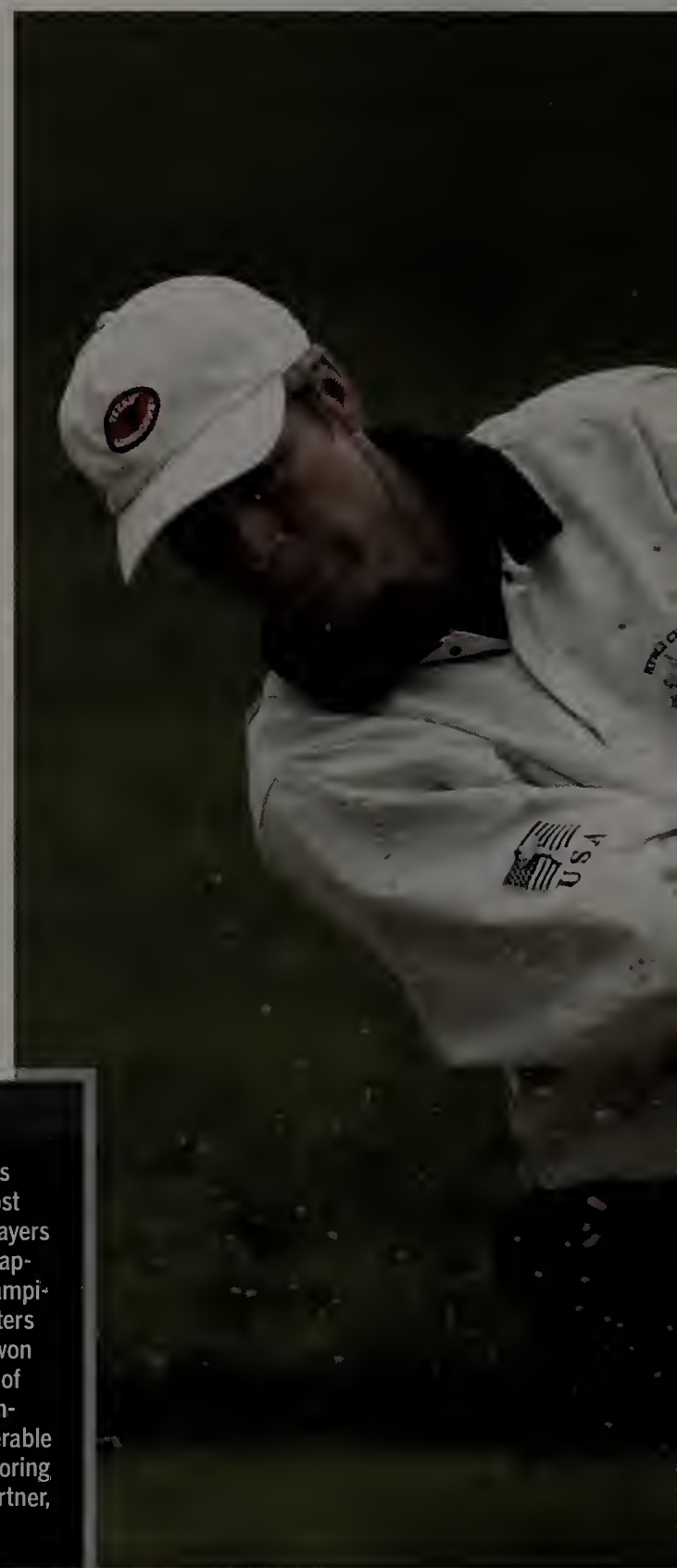
effect of titanium clubs. Twenty years ago, Jack Nicklaus was warning us about the trend of increasing golf ball carry, and we thought he was crazy. But he was right, and now the distance the ball is traveling is having a profound and negative effect on course architecture and the very nature of the game.

The 1920s was the era of classic golf course design. Those courses are the standard bearers for golf, with their combinations of natural surroundings, dimension, scope, variety of hole and all of the other things that add up to fine architecture. But the old classic courses such as Pine Valley, Merion, Winged Foot, Cypress Point and Pebble Beach are in trouble now. Some of them are being lengthened, rebunkered and widened in spots to accommodate tee shots that are landing in places no shots have ever landed before. In the process, they're losing their character and charm.

Those that aren't being changed run the risk of losing their importance as competitive venues. Augusta National, the home of the Masters, today bears little resemblance to what it was just a few years ago, having undergone major renovations in 2000—resiting tees, lengthening holes, adding rough—

### About the Author

» **BEN CRENSHAW** has long been one of the most popular and talented players on the PGA circuit. He captured his first major championship at the 1984 Masters Tournament, which he won again in 1995 at the age of 43. In recent years, Crenshaw has spent considerable time designing and restoring golf courses with his partner, Bill Coore.



There are a lot of people, myself included, who believe it's time to call a halt to the technological advances in the game. As a matter of fact, we may have already gone too far.

just to stay ahead of the technology.

Now, there are a good many folks who say these changes are good. They bring more people to the game, they say, because advanced designs in equipment make it possible for the average player to shoot a better score, hence, making the game more pleasurable. Certainly, like any other form of recreation or entertainment, golf wants to attract as many people as possible. But consider: I'm 51 years old now, and I hit the ball as far as I ever did. That's a pretty preposterous assertion, but it's true. It didn't use to be that way. You used to lose power as you got older, but the new equipment is compensating for that.

Technology is only providing an illusion of better play. It's the allure of power.

**THE NEWS** is not all bad for this sport, however. Consider the improvements in the technology used to broadcast golf tournaments. The drama, the clarity and the sense of closeness you get to the players are really amazing. On the Internet, you can now follow every shot of every player as it's happening. At St Andrews, during the British Open, they now have the "bunker cam," a camera right in the bunker on the 17th hole, which is one of the most famous bunkers in all golf. It gives the audience a real sense of the game, a sense for how good these tournament pros really are. Perhaps some time soon we'll even have a "golf ball cam." This, I think, more than anything else, has helped make the game more interesting and watchable, even engaging nongolfers.

As with almost everything else in life, when it comes to technology the important thing is to find the right balance. The challenge will be to continue to make the game better, more accessible and more enjoyable—but without compromise. We have to be selective enough about the technologies we embrace to ensure that we pass along to the next generation the same game we inherited from the previous one. ■

Jerry Gregoire is a retired CIO and amateur golfer who's had the good fortune to play with many great pros, including Crenshaw, at Crenshaw's new course in Austin, Texas, where Gregoire lives.



PHOTO BY AP/WIDE WORLD PHOTOS

## CONNECTIONS

# Jonathan Zittrain

## The End of Hide-and-Seek

**A FEW WEEKS AGO I BROKE DOWN** and RFIDed my dog, Mrs. Beasley. She'd released herself on her own recognizance from others' care twice, and after the last episode—involving four days at large in Woburn, Mass., and a close encounter with a commuter train—it seemed entirely fitting to inject a radio frequency identification chip the size of a grain of rice under her skin. The chip contains a unique serial number that will match Mrs. Beasley back up to me should she be turned in to a shelter or vet that uses an RFID scanner.

Indeed, I likely won't stop there—transponders with GPS arrays are just about to find their way into the pet-retrieval business, and for a few hundred dollars I'll be able to use a laptop or PDA to pinpoint Mrs. Beasley's location at all times. If I and roughly 1.8 million other Americans have RFIDed our pets to help find them if lost, why wouldn't responsible parents LoJack their children as well as their cars?

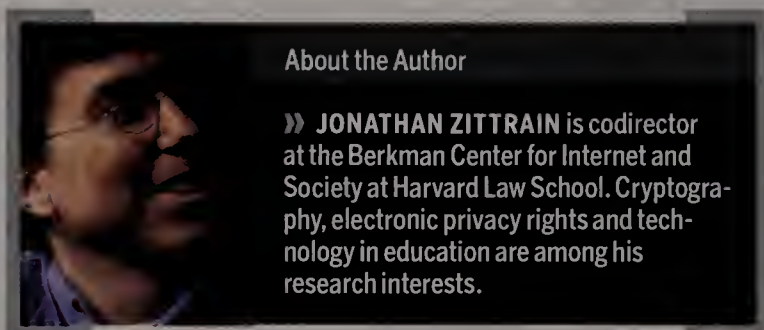
I think they would and will as soon as the technology becomes stable and cheap. What seems downright wrong or at least surreal can soon become routine, as people recognize the benefits of a new technology—particularly a safety-oriented one. Assigning unique identifiers to humans has an ignominious past, but images from the first set of children to be reunited with



their parents thanks to such technology will casually moot years of debate and anxiety about ubiquitous surveillance and its manifest potential for abuse.

Ending most games of hide-and-seek is only the beginning. Companies such as nTag Interactive offer interactive RFID units for use at conventions and meetings. An exchange of personal data is trig-

gered after two people stand across from each other for more than a minute, permitting attendees to generate a report of everyone they meet at the conference. People with overlapping interests might be especially targeted for each other, with tags indicating just how much reason they have to want to get acquainted. The implications flow far beyond expo center floors. Imagine being able to walk down a busy downtown street and automatically discern old col-



### About the Author

» **JONATHAN ZITTRAIN** is codirector at the Berkman Center for Internet and Society at Harvard Law School. Cryptography, electronic privacy rights and technology in education are among his research interests.



## Want to cut your IT costs without sacrificing performance? PRIMEPOWER Servers from Fujitsu.



The secret is out. PRIMEPOWER™ Solaris™-compatible servers from Fujitsu® deliver a major breakthrough in price/performance compared to our more famous competition. Want proof? PRIMEPOWER servers offer such an advantage that the world's leading companies use them to boost their performance. And there's a PRIMEPOWER server that's right for any application you need — from single CPU, rack-mounted servers to enterprise-ready systems that scale to 128 CPUs for unsurpassed performance in the data center.

Of course, it's not just the hardware you're buying. It's also Fujitsu's 30+ years of experience supporting high-performance, mission-critical systems. We've already helped many companies consolidate their IT infrastructures and lower their Total Cost of Ownership. Our free white paper, *The Why and How of Server Consolidation*, explains how. Get your copy at [www.ftsi.fujitsu.com/ad](http://www.ftsi.fujitsu.com/ad). Or call (877) 905-3644.

**FUJITSU**

THE POSSIBILITIES ARE INFINITE

Zittrain, continued

lege acquaintances, friends of friends, even lost relatives. The alienation within the modern Western city—so many people, each pretending not to notice one another—could be replaced by the thousands of serendipitous encounters and moments that otherwise don't happen because we are a hair's breadth away from being in just the right place at the right time.

There are many articulate inventories of undesirable results from privacy-invading technologies; one can bemoan the prospect that a private investigator or nosy neighbor could point a dish at someone's house and immediately inventory all the RFIDed products (and pets and people) inside. Innocent people as well as the guilty could be located in a heartbeat by a government already

I don't regret  
the RFID in  
my dog.

enamored with ankle bracelets for those under house arrest. Objections such as those cause refinements in the systems—an element in RFID standards that supposes one might want to disable them—or even slight delays in their adoption. Wal-Mart, which had been among the first to declare its intention to roll out RFIDs, just canceled a joint test of them with Gillette in a Boston-area retail store. Instead, Wal-Mart is installing RFID systems in warehouses and distribution centers; retail stores can follow later.

But, like most privacy-related objections to anything, they will attenuate with time if the case for convenience and safety can be made. I don't regret the RFID in my dog, and by the time I have children, I likely won't regret RFIDing them either—indeed, it'll most likely be as routine and responsible a part of the delivery process as cutting the umbilical cord. It will be an act that replaces a physical cord with a much thicker virtual tether, both a conduit to and from the limitless expanse of cyberspace, and a chain anchoring one to it. ■

## PUBLIC OPINION

# Paul Saffo

## Convenience Trumps Privacy

**READY OR NOT, RADIO FREQUENCY IDENTIFICATION—OR RFID—TAGS ARE** poised to show up in a supply chain near you. These tiny chips will revolutionize inventory logistics, but the prospect of their deployment into retail environments is already giving privacy advocates the willies. The bad news:

Commerce will trump privacy concerns. The good news: While deployment into the back end of commerce is imminent, the economics of RFID will delay consumer point-of-sale presence for some time. The only certainty about RFID deployment is that it's going to be a turbulent ride.

Blame much of RFID's buzz on Gillette, whose order for 500 million RFID chips earlier this year thrust the technology into the news. Wal-Mart further fanned the flames by informing its suppliers that it wants all the products it supplies to contain RFID tags. Even Microsoft is getting into the act with an announcement that it intends to develop software and services to support RFID use in the retail and industrial sectors.

Those ambitious plans are driven by the belief that RFID will revolutionize the tracking and management of everything from industrial equipment to pharmaceuticals and even heads of lettuce. Stick an RFID chip onto a part or a package and a previously inert object can now account for itself whenever it is tickled by a radio signal from a questing sensor. Industries with special problems will be early adopters: Gillette's interest in RFID stems in no small part from its desire to solve shoplifting of razors, while cigarette manufacturers want to enlist RFID in an effort to stop interstate cigarette smuggling. At its most extravagant, RFID represents nothing less than the successor to the ubiquitous bar code.

While the trajectory of RFID is clear, the speed of its adoption is less certain. The cheapest RFID chips today still cost more than two and a half cents in quantity. Cheap in comparison to what gets stuffed in a laptop, but horrendously expensive when contemplating a chip in every milk carton or box of detergent. Then there is the cost of the tag readers and the dizzyingly complex infrastructure required to collect, sift and move the vast amounts of data RFIDs generate. Little wonder that Wal-Mart backed off its previously announced deployment plans.

Sorting all this out is a decade-long task, but the industry has a running start. Thanks to the leadership of the MIT Auto-ID Center, in effect a multi-industry consortium of companies pioneering RFID use, there exists a widely accepted RFID standard.

And islands of RFID use directly touching the consumer are already appearing. Singapore's National Library chipped all of its books a few years back, and now patrons check out their own books while "smart" book drops automatically check in returns.

Tomorrow's RFID chips won't just spit out serial numbers; they will also carry data and myriad sensors, transforming inert objects into "smartifacts"—intelligent artifacts that interact with the surrounding environment. Add this all on top of today's search engine craze, and I'll bet we'll eventually have "IndexBots" running



#### About the Author

» As director of the Institute for the Future, **PAUL SAFFO** studies long-term trends in information technology and assesses their effects on business, culture and society.

around the landscape hunting and cataloging every RFID chip they find.

No wonder consumer privacy advocates are already fretting over RFID. The privacy implications of a smartifact world are indeed as chilling as they are unpredictable. RFID itself is not privacy-eroding—the risk is determined by the architecture of the RFID standard and supporting systems. But developments in other areas offer no comfort. Consider the FasTrak electronic toll system, a system that could have been made anonymous, but instead dutifully tracks and records where and when cars cross toll points. The promise by developers that FasTrak would never be used for anything besides tolls has already been broken in California where

additional sensors are being deployed to track FasTrak transponders to analyze and control traffic flow. Again, the public has been promised that individual data is not being preserved, but in these terror-obsessed times, one does not have to be a paranoid to react with a cynical snort of disbelief.

I suspect that the biggest challenge to privacy will not be from corporate or government push, but consumer pull. In the short run, the same consumers who fret about privacy will likely be happy purchasers of RFID-based home inventory systems. Even as they object, they will be sticking RFID chips on their pets and into their kids' schoolbags.

And when in-store RFID deploys, proponents will inevitably establish links to in-home devices. Consider a

future home-shopping scenario in which sensor-equipped refrigerators track what is used, generate and place shopping orders, and even warn consumers if the milk they are about to drink is old enough to have a driver's license. Wary consumers could disable chips in the items they buy, but then they would have to do their ordering manually. Americans may seem to be privacy-hawks, but they are also lazy and suckers for anything that sounds like a deal. Given a devil's choice between privacy and convenience, the vast majority of consumers will choose the latter. ■

# CIO ENTERPRISE VALUE RETREAT AWARDS CEREMONY®

## IT'S ALL ABOUT IT VALUE

FEBRUARY 8 - 10, 2004 • TRUMP INTERNATIONAL SONESTA BEACH RESORT • SUNNY ISLES BEACH, FLORIDA



### Retreat Moderator: Peter Weill

Director, Center for Information Systems Research, MIT Sloan School of Management

### The Case Studies

Peter Weill once again joins us to present new findings and case studies from work with hundreds of Global 1000 companies, focusing on IT needs for different business models. He will also conduct a workshop on IT governance with insights and case studies from MIT CISR's study on how top financial performers govern IT and the five key decisions—IT principles, architecture, infrastructure, applications needs and investment.

**"The content presented by Peter Weill was an excellent framework to discuss current challenges with a very interesting peer group."**

—CHRIS ACTON, GLOBAL IS, RIO TINTO BORAX

**"A must for any CIO. Addresses the larger issues a CIO faces, without getting lost in technical details."**

—GERHARD KARBA, CIO, HINES INTERESTS

### The Enterprise Value Award Winner Presentations

They're first scrutinized by CIO editors, then visited by our Review Board members—and finally make it through our judging panel of top-notch CIOs. Winners of this year's prestigious CIO Enterprise Value Award share how they delivered true value.

**"Excellent opportunity to network with those who have overcome the various challenges. Lessons learned are not the usual academic fare, but the subtleties of the cultural and technological minefields."**

—EVELYN LOCKETT WOODS, EVP/CIO,  
JOINT COMMISSION ON ACCREDITATION OF  
HEALTHCARE ORGANIZATIONS

**"The award winner presentations were extremely valuable in terms of the process and ingenuity insights laid out."**

—TOM GAYLORD, VP/CIO, UNIVERSITY OF AKRON

### The Peer Networking

From informative chats at breakfast and lunch roundtables, to the intensely interactive case study workgroup sessions, to relaxed conversations during the daily end-of-sessions receptions—we give you more opportunities to meet and learn from more of your peers.

**"The discussion and information exchange with peers is invaluable."**

—ROBERT ODENHEIMER, SVP, IT OPERATIONS,  
MAGELLAN BEHAVIORAL HEALTH

**"The premier conference for CIOs. A great opportunity for learning and networking."**

—ANGELO PRIVETERA, CIO, HDR, INC.

*This year's Enterprise Value Retreat Awards Ceremony is proudly underwritten by*



Assuring Business Availability®

Presented by



The Resource  
for Information  
Executives

Call 800.355.0246 or visit us at [www.cio.com/conferences](http://www.cio.com/conferences)

## HEALTH CARE

# Newt Gingrich The Cure for What Ails Us

**WE MUST FACE THE REALITY THAT 76 MILLION BABY BOOMERS ARE NEAR-**ing retirement and consider how that will affect the future of health and health care. As the baby boomers age, they will begin to use the health-care system with greater frequency. And they will expect what they have always received: high quality at low cost.

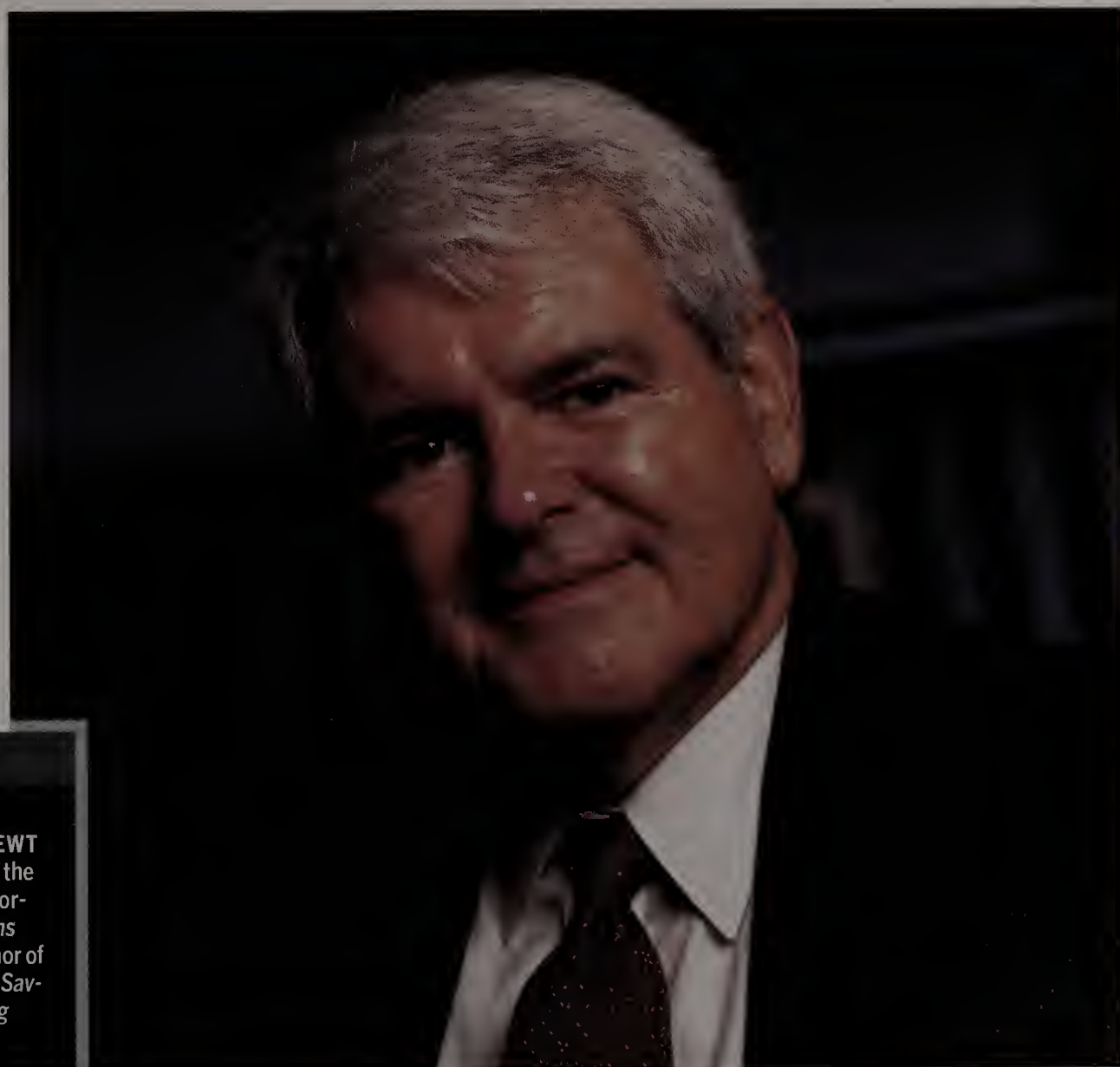
The best way to continue this level of service and improve upon it is by harnessing the power of information technology. Up until now, however, the health-care industry has failed to utilize IT systems that could dramatically improve the safety of health care while lowering overall costs.

As every IT professional knows, the world in which we all live is replete with consumer-based expert systems that are handling millions of transactions every day in real-time. They operate seamlessly and are amazingly accurate. So accurate, in fact, that many consumers no longer get a receipt for their electronic transactions. As an example, look at gasoline purchases. Consumers are so confident that a gas pump anywhere in the country will be so fast that they do not even think about the two seconds it takes for the credit card to turn the pump on. They also believe that that same gas pump is so safe and accurate that they are willing to allow their personal financial information to travel through an electronic network to take money from their personal account. All from a gas pump.

Now, let's contrast that with a health-care system in which sick patients are routinely expected to fill out multiple forms with the

same information that they have been asked to fill out numerous times before. A health-care system in which the Institute of Medicine

reports that we lose between 44,000 and 96,000 Americans every year due to medical errors—the equivalent of a New York to Washington airline shuttle full of passengers crashing every day, killing everyone on board. Our current health-care system tolerates 2 million hospital-induced illnesses a year. In other words, if you spend more than four days in a hospital, the chances are even money that the hospital will give you a disease that the hospital will then charge you to treat.



### About the Author

» Former Republican Speaker of the House **NEWT GINGRICH** is founder of the Center for Health Transformation ([www.healthtransformation.net](http://www.healthtransformation.net)) and author of the book *Saving Lives & Saving Money: Transforming Health and Healthcare*.

**Gingrich,** continued

Today, there are 18 people in the health-care system for every doctor. Instead of paying the doctor to provide us with health care, we are paying the health insurance company to pay the doctor to pay the clerical people to determine what kind of health care the insurance company believes we are eligible to receive.

**THERE IS NO REASON** that an expert electronic system could not verify the services you are eligible to receive while you are still in the doctor's office. It could file claims instantly while sending your prescription electronically to the pharmacist. There is no reason the doctor's office could not print out your "Explanation of Benefits" from your insurer, listing what you were charged for, how much you were charged, how much the insurance paid, and how much you owe. The doctor could then give that to you as you walk

kill people because errors are going to happen with billions of handwritten prescriptions. Yet, according to a 2002 Harris Survey, even with the technology readily available, only 16 percent of office-based physicians are using electronic prescribing tools, and only 2 percent to 3 percent of the prescriptions dispensed annually are currently processed electronically.

Medication errors contribute to more than 7,000 deaths annually, exceeding those resulting from workplace injuries. Yet we have no OSHA-like response in health care. According to a report by the Institute for Safe Medication Practices, medication errors could be cut by 55 percent if physicians switched to electronic prescriptions. But this is more than a theory. A computerized physician order-entry system at the Metropolitan Hospital Center in New York City helped reduce medication errors by more than 40 percent. Incorrect drug orders fell by 45 percent, and illegible orders all

every pharmacist, every veterinarian, every hospital, every nursing home, and every pharmacy in the country. Creating such an IT backbone for our health-care system is imperative. And once it is built, we should use the system routinely to share information to improve patient care and save millions of health-care dollars by providing every medical professional with access to the latest information on best practices.

Doctors could consult on difficult cases across state lines in real-time by sharing lab results, images and medical history. Moreover, such a system could be used as a platform to create an electronic drug-purchasing system and insurance-purchasing system not unlike the travel sites Expedia or Travelocity. That would rapidly begin a downward pressure on health-care prices.

In order for such a system to work, we should encourage entirely digital environments in doctors' offices and hospitals, like the sys-

Prescriptions should be electronically administered, period. The time for encouraging their use with increased compensation has passed. The number of lives and dollars wasted demand that Congress mandate electronic prescriptions.

out the door. There is no reason why there cannot be a similar printout from the insurance company when the claim is filed so that the patient could pay the doctor for his portion of the bill. All of which would reduce the number of clerical people the doctor and insurance company need to employ.

Computerized order-entry systems also offer enormous potential. Doctors continue to write billions of handwritten prescriptions every year, more than 150 million of which require the pharmacist to call the doctor back for one of three basic reasons: the pharmacist cannot read the writing; the drug is not compatible with another drug the patient is taking; or the pharmacist wants to substitute a drug so that the patient's insurance will cover it. That is an enormous waste of time and resources for an easily correctable problem.

But more important, written prescriptions

but disappeared.

I served on the Aviation Subcommittee in Congress. If a pilot decided he did not feel like doing a procedure that the Federal Aviation Administration required to ensure a safe flight, that pilot would be grounded. If an airline announced that it had a policy of being "as safe as our quarterly report would permit," the airline would be shut down. Yet we have tolerated this in medicine. Prescriptions should be electronically administered, period. The time for encouraging their use with increased compensation has passed. The number of lives and dollars wasted demand that Congress mandate electronic prescriptions.

**AS THE FIRST** giant step toward this mandate, Congress should fund the construction of a sophisticated nationwide real-time IT system as a first responder to a biological attack to connect

tems at the Mayo Clinic in Jacksonville, Fla., or the Indiana Heart Hospital. Those systems allow doctors to access, with your permission (or without your permission in an emergency), your complete health history, including any allergies you might have and the medications that you are currently taking. Congress should reward hospitals and doctors for reducing medical mistakes, but in order to do that, we must establish a real system of medical justice. This system might include a health court that would allow medical professionals to report errors while protecting them from predatory litigation.

With all of the information technology available today, we can no longer accept suffering and death because of prescription errors or any other preventable errors.

Seventy-six million baby boomers and their children will demand no less. ■

## INCOME STATEMENT

For the year ended Dec. 31, 2008

### REVENUE

Total Revenue

### EXPENSES

Total Expenses

### NET INCOME

*In the future, you have no earnings.*

*You have no margins.*

*You have no net loss or net gain.*

*No one does.*

*Because the future hasn't happened yet.*

*It is a white canvas. A blank sheet. A clean slate.*

*What will you make of it?*

AN UNBIASED BUSINESS ADVISOR AND SYSTEMS INTEGRATOR PROVIDES YOU WITH THE RIGHT ADVICE AND SOLUTIONS  
WITH YOUR BEST INTERESTS IN MIND. TOGETHER, WE CAN CREATE THE FUTURE. VISIT [BEARINGPOINT.COM](http://BEARINGPOINT.COM).

CONSULTING ♦ SYSTEMS INTEGRATION ♦ MANAGED SERVICES

**BearingPoint**<sup>™</sup>

Business and Systems Aligned. Business Empowered.™

# Juan Enriquez

## The Data That Defines Us

**SARAH, A 60-YEAR-OLD WOMAN IN REMISSION FROM COLON CANCER,** moves from San Francisco to Boston. She celebrates reuniting with her grandkids by eating a delicious Indian dinner. But it's a little spicy. During the next few days, she suffers from a dull pain in her lower abdomen. Her son, concerned, sets up an appointment with a new internist.

After hearing Sarah's complaint and history, the doctor orders a series of tests including a CT scan. The image shows a 2-centimeter, ill-defined nodule in her pelvic area. Other than that, the scan is unremarkable.

The radiologist compares the new scan with a series of digitally stored CT scans from the office of Sarah's San Francisco-based oncologist. The internist is relieved to see that the nodule is unchanged. Furthermore, a series of gene chip analyses that indicate which genes are over-expressed and which are under-expressed show

had to endure further treatments and perhaps exploratory surgery. Now, with a rich and accessible trove of data from a variety of digital and genomic sources, health-care providers can make better decisions faster. This is good. It is not, however, the whole story.

**FOR MOST OF MEDICINE'S** history, the average patient has generated very little data. Most patients see their doctors a couple of times per year, if that, and their diagnoses and treatment regimes are simply written down. A typical

patient file consists of about 1.5 pounds of paper. This includes not just clinical data but also insurance, pharmaceutical and other administrative information. Except for people who end up in intensive care and are hooked up to monitors, individual medical records still consist of relatively small data sets. Now, however,

new technologies are generating massive and increasingly personalized health-care data sets.

Simply sequencing one version of the human genome required that a new company build the world's largest private computer and maximize the parallel processing capacity of Hewlett-

Packard's Alpha chips. Genomic code is four letters on two dimensions. Proteins have a 21-letter code that has to be modeled in three dimensions. Never mind imaging or modeling whole organs.

The volume of data that will flow through a doctor's office in the not-too-distant future will explode, as will the need to coordinate treatments and specialists. Hospitals, pharmaceutical companies, doctors' practices and all types of IT companies will increasingly seek life-science-literate CIOs.

And once we can modify the genomic code for medical purposes, we can apply the same technologies to various other industries including chemicals, cosmetics, food, drinks, energy, insurance, IT and military applications. Bioinformatic skills will be required across major swaths of the global economy.

We get a sense of how this could occur by looking at the expansion of data in historic terms. A project at the University of California at Berkeley attempted to measure the impact of going digital on the volume of data being generated by humans. It estimated that in 1999, the total of all human knowledge, music, images and words amounted to about 12 exabytes.

About 1.5 of those exabytes were generated during 1999 alone.

Some have argued that the study overstates the speed with which data accumulates. But even if that were true, the volume of bytes is growing so quickly that it would take only a few more years to achieve the data volume predicted by the study. As the cost of computing drops to 1-trillionth of what it was in 1940, and as ever-more powerful machines come to market, we could soon record everything we read, hear or see throughout a lifetime.

The massive expansion of databases is not word-driven. Storing and transmitting paragraphs, even books, is a relatively low-bandwidth affair. A small book can be stored in one diskette. Music represents a leap in storage and transmission requirements. You can see the impact with the rise of music swapping programs. Few colleges were prepared for Napster; by the time 1 million downloads had occurred nationally, some colleges had used up all their bandwidth.

High-resolution photographs are another order of magnitude. They say a picture is worth a thousand words. Actually a 4MB picture can be worth 400,000 words.

This is a significant change in terms of data flow. To put this new data volume in context, according to the Berkeley study, in 1999, the



#### About the Author

» **JUAN ENRIQUEZ**, author of *As the Future Catches You*, was the founding director of the Harvard Business School Life Sciences Project. He is currently chairman and CEO of Bio-technomy, a company that funds enabling technologies in the areas of genomics, proteomics and medical devices. A significant

part of the research for this article was done by Mary Shelman, a former Harvard Business School research fellow.

that Sarah's loss of imprinting markers are low, indicating that cancer has most likely not returned. After considering an ever-larger data set, the internist sits Sarah down and makes his only suggestion: Avoid spicy foods.

A few years ago, Sarah probably would have



## Customers are an investment. Maximize your return.

**PeopleSoft Customer Relationship Management lets you capitalize on every customer interaction across your enterprise.**

Only PeopleSoft CRM is fast to implement, easy to use, and delivers smart business processes for managing your customer relationships. It integrates real-time information across your organization to help determine the most profitable ways to manage customers. Simply, PeopleSoft CRM turns every point of customer contact into a profit opportunity. Learn more by visiting us at [www.peoplesoft.com/realtime](http://www.peoplesoft.com/realtime) or call 1-888-773-8277.

**PeopleSoft®** | **Customer Relationship Management**

Enriquez, continued

upper estimate of books being digitized annually was 8 terabytes, periodicals 12 terabytes, newspapers 25 terabytes, and all office documents 195 terabytes. This is trivial compared to the upper estimate of photographs; if digitized, the 80 billion photographs taken in 2000 would require about 400 petabytes of storage space. That is around 1,700 times the storage required for all text generated during the same period.

**THE LIFE SCIENCES** will top that. Until very recently, there was little need to digitize and manage a lot of bits per patient. High-density, data-intensive applications, such as X-ray images, were printed rather than digitized. Unlike Sarah, patients had to seek and then carry the images physically from place to place.

But as the number of specialties grows, and as people increasingly move and change health plans, it becomes harder to know a patient's history. A typical hospital patient now has 11 medical charts and takes 14 medicines. Keeping track of even this relatively trivial volume of data is overwhelming doctors. Medical errors are proliferating and killing thousands.

As data from genomic and proteomic applications migrate from researchers' lab benches and become standard patient treatment protocols, we can expect to see much more tailored medical diagnosis, prescription and treatment profiles. Silicon chips covered with little strands of DNA sometimes are able to show which genes are turned on or off during various normal and disease states. Their use is growing 65 percent per year. Given that many experiments have to be continuously repeated because findings are dependent on age, time and environment, and given that a single experiment can generate a half billion data points, a great deal of data can accumulate very quickly and overwhelm researchers if they lack strong IT-analysis support.

Hospitals, pharmacists, doctors and patients will have to manage and triage ever-growing volumes of complex data in cost-effective ways. As profiles become more predictive and personalized, privacy will become a key issue. We will face complex questions as large databases go online and become more accessible. Who should have access to data about potentially disabling diseases, ones that we may contract at some time in the future, but that have not yet appeared within our bodies? For instance, if you have a BRCA-1 or BRCA-2 gene, you may be more

predisposed than someone else to breast cancer. Do you want your employer and your insurance company to know that? Probably not. So who should manage and have access to your data? And what do you do if your risk profile changes significantly because of tests you have already taken but that had not yet been seen as key predictors given current genetic knowledge?

Until quite recently, life sciences had not been large-scale drivers of global data generation and

storage. However, several computer, Internet, software and storage companies are beginning to see life sciences as a key opportunity for growth. Those who get literate in life code are likely to have many more job opportunities, and they may be equipped to make more intelligent decisions in areas as disparate as portfolio management, personal health, insurance and computer networking possibilities.

Are you ready? ■

## SPIRITUALITY

# The Dalai Lama Computers and The Buddha Nature

**IN HIS YOUTH, LHAMO DHONDRUB ENJOYED REPAIRING CLOCKS AND watches at his home in Taktser in northeastern Tibet. That early affinity for technology and the sciences continues today, although he is now known by another name: His Holiness Tenzin Gyatso, the 14th Dalai Lama. While it**

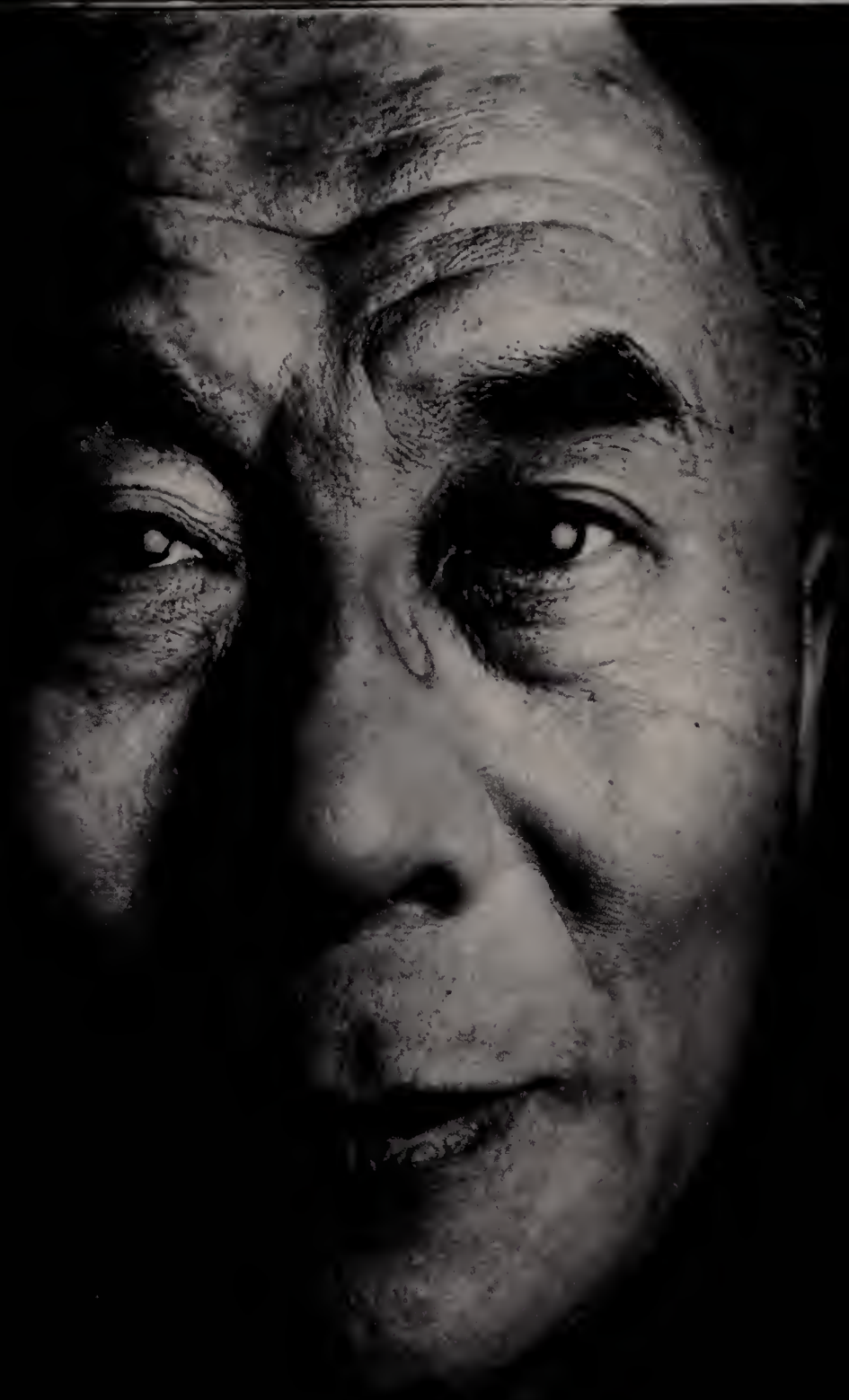
may be hard to imagine the spiritual leader of the world's Tibetan Buddhists and the political leader of the Tibetan people doing something as mundane as fixing a watch, there are many similarities between the Dalai Lama's views on the scientific method and on spiritual evolution. In this excerpt from *Gentle Bridges*, a chronicle of the first Mind and Life Conference, a meeting of Western scientists and Tibetan spiritual leaders, the Dalai Lama reflects on the development of technology and humanity.

**WITH THE GROWING** impact of science on our lives, religion and spirituality have a greater role to play reminding us of our humanity. There is no contradiction between the two. Each gives us valuable insights into the other. Both science and the teachings of the Buddha

tell us of the fundamental unity of all things.

Western civilization's science and technology bring society tremendous benefit. Yet, with highly developed technology we also have more anxiety and more fear. Mental development and material development must be well-balanced, so that together they may make a more human world. If we lose human values and human beings become part of a machine, there is no freedom from pain and pleasure. Without freedom from pain and pleasure, it is very difficult to demarcate between right and wrong.

So it is important for Western science and material development and Eastern mental development to work together. Some people have the impression that these two things are very different, even incompatible. However, in recent years this has changed. Some Western scientists have



#### About the Author

» His Holiness the 14th **DALAI LAMA** travels the world speaking on compassionate and peaceful resolution of human conflict, universal responsibility and kindness. He is the 1989 recipient of the Nobel Prize for Peace.

reached highly sensitive and deep issues in their research work, such as what is the mind, what is "I," what is a human being? They are developing a more philosophical inclination.

The approach of Buddhism, especially Mahayana Buddhism, is very close to the scientific approach. According to the Mahayana point of view, there were three major turnings of the wheel, as the

three main cycles of the Buddha's teachings are called. The teachings given during these cycles are literally contradictory. Since all these teachings were genuine words of the Buddha himself and they contradict each other, how do we determine which are true and which are not? Even if we were to make the distinction on the basis of some scriptural citation, then that again must

depend on something else to validate its authenticity. Therefore, the final validation must be done on the authority of reasoning and of logic.

Analysis and examination through reasoning, the basic Buddhist attitude, is very important. Once you find a fact through investigation, then you accept it. Because of this, the basic Buddhist attitude is quite similar to the scientists' attitude. Be open and investigative, find something, confirm it, then accept it. Whichever way you go, there is a strong emphasis upon your

## The Dalai Lama, continued

own analysis and investigation and not simply a dogmatic adherence out of faith.

**THE PERSON** who makes a program for playing chess naturally needs to know how to play chess. So if a mediocre chess player makes a program for the computer, and the computer could come around and beat the mediocre player, doesn't this suggest that the computer is thinking? We can't say it has consciousness or cognition, because the concept of cognition has to be based on a continuum of cognition from the previous moment. It is not something derived from matter. So, for example, if there is no reference to any subtle consciousness, then there's no question of a gross consciousness arising from within the absence of subtle consciousness. I was thinking whether certain physical substances, as a result of some kind of interaction, can have a relative level of cognitive feeling—not actual cognition, but some facsimile of it.

In terms of the actual substance of which computers are made, are they simply metal, plastic, circuits and so forth? It is very difficult to say that it's not a living being, that it doesn't have cognition, even from the Buddhist point of view. Consciousness doesn't actually arise from matter, but a continuum of consciousness might conceivably come into it. Whether the physical basis of the computer acquires the potential or the ability to serve as a basis for a continuum of consciousness will be resolved only by time. We just have to wait and see until it actually happens. Matter can only be a cooperative cause, never the main or substantial cause for consciousness.

This is very much related to cosmology. In the Buddhist view of evolution, there is an infinite universe. Any world system will go through phases. Sometimes it is destroyed, sometimes it arises, sometimes there will be gross matter, sometimes no gross matter, but really there is no beginning or end to it. And there is always a subtle consciousness. ■

*Excerpted from Gentle Bridges, by Jeremy Hayward and Francisco Varela. Reprinted by arrangement with Shambhala Publications and with the Mind and Life Institute.*

## POWER

# Howard Rheingold The War Over Innovation

**THROUGHOUT HISTORY, NEW COMMUNICATION TECHNOLOGIES AND social arrangements have enabled people to organize collective action on ever-larger scales. When this happens, human civilizations jump to high levels of complexity. This has been so since the printing press spread literacy beyond**

the ruling classes and enabled such new forms of collective action as science and democracy. For the past century, the wiring and unwiring of earth, followed by the emergence of the Internet, have enabled collective action to take place globally, simultaneously and virtually. Tomorrow, mobile communications and pervasive computing technologies could herald an era of smart mobs in which the devices we carry and wear link us in ways undreamed of today.

However, if today's PC and Net users aren't vigilant, the future might not be as user-centric as the past. It all depends on what kinds of laws and restrictions will be burned into next-generation hardware and operating systems.

Collective action happens when the aggregate actions of people add up to something instead of canceling each other out. The first humans who banded together to hunt big game; the first scientists who

created a body of knowledge by pooling experiments and findings; the investors who invented the modern corporation in European coffee-houses; the people whose individual link choices add up to Google's page rank—all have been involved in collective action.

Today, collective action can involve devices as well as social contracts. Napster (intellectual property considerations aside) enabled 70 mil-

lion computers to become, in effect, a giant music library. Seti@home ([setiathome.ssl.berkeley.edu](mailto:setiathome.ssl.berkeley.edu)) and Folding@home ([folding.stanford.edu](mailto:folding.stanford.edu)) enable millions of people to contribute their computers' idle computation cycles to searching for life in outer space or help biomedical researchers understand protein structure. Open-source software is created collectively, organized and coordinated online. What is the Web itself but the collective contributions of millions of people and their browsers,

### About the Author

» **HOWARD RHEINGOLD** is a founder of Net communities and a chronicler of life online. His books include *Tools for Thought: The History and Future of Mind-Expanding Technology*; *The Virtual Community: Homesteading on the Electronic Frontier*; and most recently, *Smart Mobs: The Next Social Revolution*. He also has served as editor of the *Whole Earth Review*, editor in chief of *The Millennium Whole Earth Catalog*, and executive editor of *HotWired*.

# SECURITY

## EVERY STEP OF THE WAY

(ISC)<sup>2</sup><sup>®</sup> Provides the Gold Standard<sup>SM</sup> of Certification for Security Professionals Throughout Their Career Path

**Q** What do the U.S. National Security Agency, Deloitte-Touche Consulting, U.S. Veterans Administration, Novell Inc., and the Federal Aviation Administration have in common?

**A** All increasingly expect the employees they entrust with critical, confidential, and valuable data to have earned the information security profession's top seal of approval: (ISC)<sup>2</sup> certification.

Those organizations are among a diverse, fast-growing group of employers who view the International Information Systems Security Certification Consortium—better known as (ISC)<sup>2</sup>—as the best resource for finding the best-qualified security professionals.

(ISC)<sup>2</sup>—pronounced “I-S-C squared”—has long granted the industry's most sought-after credential for mid- and senior-level information security professionals, the title of Certified Information Systems Security Professional (CISSP<sup>®</sup>). Earning that title is no cakewalk: Candidates must log four years of professional experience, subscribe to (ISC)<sup>2</sup>'s Code of Ethics, and pass a rigorous six-hour exam. While other credential-granting organizations exist, the CISSP remains the global “gold stan-

dard” for information security certification. Additionally, (ISC)<sup>2</sup> offers the Systems Security Certified Practitioner (SSCP<sup>®</sup>) for systems, network, and security administrators. The SSCP credential requires one year of professional experience, passing a four-hour exam, and, of course, subscribing to (ISC)<sup>2</sup>'s Code of Ethics.

While other industry certifications tend to be highly specialized, often involving a specific vendor, (ISC)<sup>2</sup> “is really a foundational certification that shows an understanding of security from a holistic viewpoint,” says Michael Rasmussen, an analyst with Forrester Research Inc. In addition, Rasmussen says, (ISC)<sup>2</sup> credentialing offers unparalleled credibility, requiring recipients to demonstrate not just correct test answers, but a track record in the field as well.

To date, (ISC)<sup>2</sup> has certified nearly 20,000 information security professionals in 90 nations; that number is expected to reach 50,000 in 2006.

Now, in response to marketplace demand, (ISC)<sup>2</sup> offers education, training, and credentials for security professionals at every stage of their career—from recent college grads to veteran CISSPs and SSCPs seeking additional certifications for expertise in a specialty area. “We want to focus on the whole career path,” says Dow A. Williamson, director of communications for the

### It's What You Know: The (ISC)<sup>2</sup> CBK<sup>™</sup>

**Security professionals seeking CISSP certification must have working knowledge in 10 domains of the CBK:**

- Security Management Practices
- Security Architecture and Models
- Access Control Systems & Methodology
- Application Development Security
- Operations Security
- Physical Security
- Cryptography
- Telecommunications, Network & Internet Security
- Business Continuity Planning
- Law, Investigations & Ethics

**Security practitioners seeking SSCP certification must have working knowledge in 7 domains of the CBK:**

- Access Controls
- Administration
- Audit and Monitoring
- Cryptography
- Data Communications
- Malicious Code/Malware
- Risk, Response and Recovery

## In response to marketplace demand, (ISC)<sup>2</sup> offers education, training and credentials for security professionals at every stage of their careers.

Vienna, Va.-based (ISC)<sup>2</sup>—and himself a CISSP. “We want to provide cradle-to-grave support for information security professionals.”

Of course, requirements for the new (ISC)<sup>2</sup> offerings vary greatly, depending on candidate skill and experience levels. But all are designed to provide the same gold-standard level of proficiency as the flagship CISSP.

And that’s guaranteed to benefit two target audiences. First, there are employers, such as the U.S. Department of Veterans Affairs and others mentioned above, who seek the very best job candidates. Second, and equally important, are security professionals seeking the very best jobs—no matter where they are in their careers.

**THE SECURITY EVOLUTION**  
(ISC)<sup>2</sup> was born in 1989, when several professional associations joined forces to

create a single set of standards for professionals. Soon afterward, companies worldwide began opening their computer networks to telecommuting employees, contractors, partners and customers, promoting greater accessibility but also creating more potential threats to data security. Then came the World Wide Web. E-commerce, online databases, intranets and extranets, and even e-mail and instant messaging generated still more security risks: hacker attacks on systems or Web sites, theft of credit-card numbers or confidential data, system slowdowns or damage from computer viruses.

Not surprisingly, as network and Internet access grew, so did the demand for highly skilled information security specialists. And, of course, the need for constantly updated, industry-wide standards kept pace, too. By October 2002, (ISC)<sup>2</sup> had certified 10,000 CISSP certifications; over the next 10 months, that

number nearly doubled.

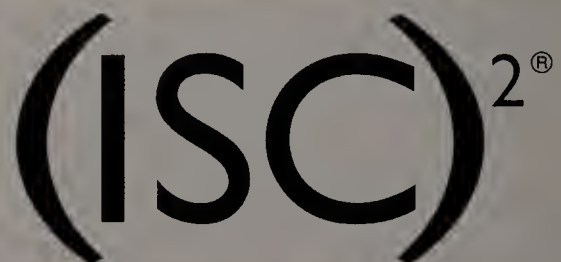
Meanwhile, (ISC)<sup>2</sup> evolved as well. The non-profit consortium kept building its CBK, the trademark compendium of industry best practices begun with (ISC)<sup>2</sup>’s founding in 1989. Questions for all (ISC)<sup>2</sup> exams are drawn from the continuously updated CBK (see “It’s What You Know,” page 1).

In 2001, (ISC)<sup>2</sup> launched a new credential, the Systems Security Certified Practitioner (SSCP). That certification supports professionals in more technical security roles, such as Network and Security Administrators. To date, (ISC)<sup>2</sup> has awarded nearly 500 SSCPs worldwide. Organization officials expect demand to grow as employers discover the credential’s value and increasingly expect to see it on resumes.

Now (ISC)<sup>2</sup> offers that same gold-standard level of support for info-security pros at every step in their careers:

### (ISC)<sup>2</sup> at a Glance

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Name:</b>               | International Information Systems Security Certification Consortium; also known as (ISC) <sup>2</sup> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Location(s):</b>        | Vienna, VA (headquarters); Palm Harbor, FL (operations); London, U.K.; Hong Kong, China.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Founded:</b>            | 1989                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Description:</b>        | (ISC) <sup>2</sup> is a non-profit organization that has certified approximately 20,000 information security professionals in more than 90 countries over the past 15 years. Dedicated to providing information security professionals with the standard for professional certification, (ISC) <sup>2</sup> grants two vendor-neutral credentials: the Certified Information Systems Security Professional (CISSP) and the Systems Security Certified Practitioner (SSCP). CISSP and SSCP credentials are based upon (ISC) <sup>2</sup> ’s CBK, a compendium of industry “best practices” for information security professionals, and require years of professional experience in their field prior to certification. (ISC) <sup>2</sup> also serves as an advocate on public policy issues affecting the information security profession. |
| <b>Executive Director:</b> | James E. Duffy, CISSP                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Motto:</b>              | <i>Security Transcends Technology<sup>SM</sup></i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Scope:</b>              | Nearly 20,000 certifications in 90 nations. By 2006, 50,000 certifications in 100 nations worldwide                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Contact:</b>            | (ISC) <sup>2</sup><br>1964 Gallows Road, Suite 210<br>Vienna, Virginia 22182 U.S.A.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Phone:</b>              | 888-333-4458                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Fax:</b>                | 703-356-7977                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Email:</b>              | <a href="mailto:info@isc2.org">info@isc2.org</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Web Site:</b>           | <a href="http://www.isc2.org">www.isc2.org</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |



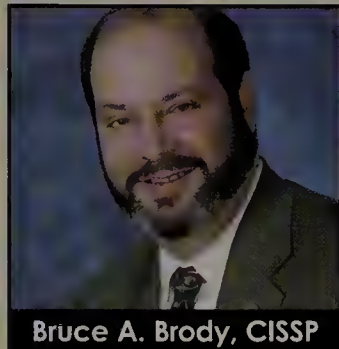
## Employer's Perspective:

“I can't imagine not having this certification.”

*When Bruce A. Brody joined the U.S. Department of Veterans Affairs in March 2001, he was only the agency's third Certified Information Systems Security Professional (CISSP).*

*“Now we have 42,” says Brody, who, as the department's associate deputy assistant secretary, oversees 118 information security workers in Washington, D.C., and Martinsburg, WV.*

*And he expects that number to grow, both through new hires and by encouraging current employees to earn the coveted (ISC)<sup>2</sup> credential: “Our goal is to have more than 100 CISSPs by the end of this year.”*



Bruce A. Brody, CISSP

*Reached between assignments early one morning, the veteran security administrator shared his thoughts about the value of (ISC)<sup>2</sup> certification:*

### Why did you decide to obtain (ISC)<sup>2</sup> certification yourself?

In terms of career advancement, I can't imagine not having this certification. There are others, but none is as meaningful. This is the most comprehensive, the most widely recognized. There's no better one to have. I believe that will be the case for the foreseeable future.

### What makes the (ISC)<sup>2</sup> certification so desirable?

Individuals who gravitate toward it are true information security professionals. You don't just take a test, although the test itself is impressive. You have to attest to a certain background, a certain number of years of specific information security experience. You

have to sign an ethics statement about your behavior as an information security professional. Then you have to take and pass the test.

### Speaking of the certification exam, just how tough is it?

When I took it, when I first cracked the book and saw the questions, I thought I had walked into the wrong room. It is a mental workout. After it ended, I was shot for the next day. It's really the equivalent of a bar exam for this career. And it is comprehensive. You can't fake it. You really have to know your ten security domains.

### As an employer, how do you view (ISC)<sup>2</sup> certification?

Whenever I have two candidates for a job who are equal in all other ways, if one has the CISSP, that's who I hire. When you hire a CISSP, you know that that person has a base level of knowledge in the field that you can draw on. The uncertainty has gone away.

### What do you expect of an (ISC)<sup>2</sup>-certified employee?

I expect the person to be a thought leader, an innovator, someone who knows their stuff. This is a person I can go to for the hardest jobs in this field, and I can expect top-quality work.

### What do you think about (ISC)<sup>2</sup>'s new offerings, designed to support security professionals at every point on their career paths?

The Associate level is a good idea. It's good to get younger individuals into the workforce to replace people who retire. If we get an Associate-level person here, we might be able to help them get to the next level. The expert specialty areas are good, too. Anything they can do to enrich the certification is valuable. ■

## STEP 1 ENTRY LEVEL

For those just starting out, there's the new Associate of (ISC)<sup>2</sup> program. This status is available to new security professionals—typically recent college graduates—who can pass the CISSP or SSCP exams, subscribe to the (ISC)<sup>2</sup> Code of Ethics, but lack the requisite experience for full certification. For the first time, the initiative allows the (ISC)<sup>2</sup> to provide support to practitioners early in their careers. “Once you pass the exam, you have access to (ISC)<sup>2</sup> resources—the Web site, peer net-

working, information to help you get used to the Code of Ethics and other professional aspects of the career,” says (ISC)<sup>2</sup>'s Williamson.

## STEP 2 PROFESSIONAL LEVEL

Mid-career professionals can continue to benefit from the (ISC)<sup>2</sup>'s best-known offerings, the CISSP and SSCP.

## STEP 3 SPECIALTY LEVEL

Established pros who already hold CISSP certification can take the next

step, establishing expertise in several advanced specialty areas called Concentrations. (Think of it as a graduate school course of study.) Options include:

### ■ The Information Systems Security Architecture Professional (ISSAP<sup>CM</sup>).

This concentration validates extensive knowledge in access control, telecommunications and network security, cryptography, requirements analysis and security standards criteria, business continuity and disaster-recovery planning, and physical security integration.

“The new concentrations increase the ability of information security personnel to balance business issues, **further develop expertise in security**, and keep up to date with trends in the industry.”

—Kevin Henry, (ISC)<sup>2</sup> Institute, director, program development

### ■ The Information Systems Security Engineering Professional (ISSEPCM).

This concentration, developed as a joint effort with the U.S. National Security Agency (NSA), validates extensive knowledge of the unique information-protection needs. The ISSEP exam focuses on systems security engineering, certification and accreditation, technical management, and U.S. government information regulations.

### ■ The Information Systems Security Management Professional (ISSMPCM).

This concentration validates extensive knowledge in enterprise-wide security management and development; overseeing of operations security compliance; business continuity and disaster-recovery planning; and law, investigation, forensics and ethics.

(ISC)<sup>2</sup> expects to offer concentrations for the SSCP credential soon.

By expanding its credentialing options to cover the whole career spectrum, (ISC)<sup>2</sup> expects to recognize its 50,000th security professional by 2006. "These options allow people to establish a career

enhance their professional credentials (for more information, visit [www.isc2.org](http://www.isc2.org)).

## THE ROI OF SECURITY CERTIFICATION

Is certification worth the effort? Absolutely—for all parties involved.

For job-hunters, (ISC)<sup>2</sup> credentials can tip the balance, especially in a tough economy. "About three years ago, we began seeing 'CISSP Preferred' in 'Help Wanted' ads," says the (ISC)<sup>2</sup>'s Williamson. "Now we're beginning to see some of them requiring that designation." Among those who look for (ISC)<sup>2</sup> certification is Bruce A. Brody, Associate Deputy Assistant Secretary for Cyber and Information Security at the U.S. Department of Veterans Affairs in Washington, D.C., who prefers to hire and promote certified employees (see "Employer Perspective," page 3). The VA, among other organizations, gives monetary bonuses to employees who achieve CISSP certification.

For employers, information security has become more critical than ever, thanks to increased regulation and concerns about cyberterrorism. "Executives and boards of directors have woken up to the fact that they could be held liable" for failing to adequately protect sensitive data, says Forrester Research's Rasmussen.

In addition, for most employers, hiring people with demonstrable state-of-the-art skills is key to the corporate security strategy. "We're creating an environment where employers know what they're getting when they hire an information security worker with (ISC)<sup>2</sup> credentials," says Williamson. "They know that person has passed a comprehensive exam, keeps up-to-date on the latest developments in the field through continuing education, and is adhering to a strict Code of Ethics."

The ethical edge is particularly important in an era of ever-escalating concerns about human, as well as technical, integrity. Put another way: Security is, at its heart, a people issue. By placing a high value on personal conduct as well as technical expertise, (ISC)<sup>2</sup> raises the bar for everyone involved in information security. After all, as Williamson notes: "Trust is the ultimate firewall. It is the real essence of relationships in the networked world." ■

For job-hunters,  
**(ISC)<sup>2</sup> credentials can tip the balance**, especially in a tough economy.

path, a plan of where they want to go," says Forrester Research's Rasmussen. Employers benefit as well, says Kevin Henry, (ISC)<sup>2</sup> Institute, director, program development. "In today's economy, nearly every business relies on a solid, stable and secure infrastructure to operate efficiently and competitively," says Henry, who holds both CISSP and SSCP credentials. "The new concentrations increase the ability of information security personnel to balance business issues, further develop expertise in security and keep up-to-date with trends in the industry."

Meanwhile, organization officials emphasize, achieving any (ISC)<sup>2</sup> certification is a beginning, rather than an end. All CISSPs and SSCPs must re-certify every three years, providing evidence that they've stayed abreast of new developments in their constantly changing field. (ISC)<sup>2</sup> provides plenty of study aids and training courses to help security specialists gain, keep and

## (ISC)<sup>2</sup> Glossary

Here are at-a-glance definitions of key (ISC)<sup>2</sup> acronyms and terms:

**Associate of (ISC)<sup>2</sup>:** Status for entry-level security practitioners who lack the requisite years of experience for full certification. Available to those who can pass CISSP or SSCP exams and subscribe to the (ISC)<sup>2</sup> Code of Ethics.

**CBK<sup>TM</sup>:** Compilation of security best practices organized into domains for each area of study, constantly updated since (ISC)<sup>2</sup>'s 1989 inception. Questions for all (ISC)<sup>2</sup> exams are drawn from the CBK.

**CISSP<sup>®</sup> (Certified Information Systems Security Professional):** (ISC)<sup>2</sup>'s flagship offering, the "gold standard" of certification, awarded to professionals with four years of relevant experience, passing grades on a 250-question exam, and willing to subscribe to a strict Code of Ethics. Primarily for security strategists.

**ISSAP<sup>CM</sup> (Information Systems Security Architecture Professional):** Concentration leading to certification for CISSPs who can demonstrate advanced expertise in access, integration, and other information security architectural issues.

**ISSEP<sup>CM</sup> (Information Systems Security Engineering Professional):** Concentration leading to certification for CISSPs who can demonstrate advanced expertise in systems security engineering and management, especially for U.S. government agencies.

**ISSMP<sup>CM</sup> (Information Systems Security Management Professional):** Concentration leading to certification for CISSPs who can demonstrate advanced expertise in enterprise-wide security development and operations, including continuity, disaster planning, and other areas.

**SSCP<sup>®</sup> (Systems Security Certified Practitioner):** Certification for information security professionals in technical, rather than management, roles, such as systems administrators and network managers. Awarded to professionals with one year of relevant experience, passing grades on a 125-question exam, and willing to subscribe to a strict Code of Ethics. Primarily for security tacticians.

each creating a small patch of the planetary weave with their webpages and links?

What new social arrangements can we build in a world of billions of devices, each more powerful than today's computers, interconnected everywhere, all the time, by wireless, high-speed networks? It is entirely possible that new industries, new ways of conducting science, powerful extensions of human capabilities will be invented by enthusiastic amateurs all over the planet—most, but not all of them, doing it from their dorm rooms.

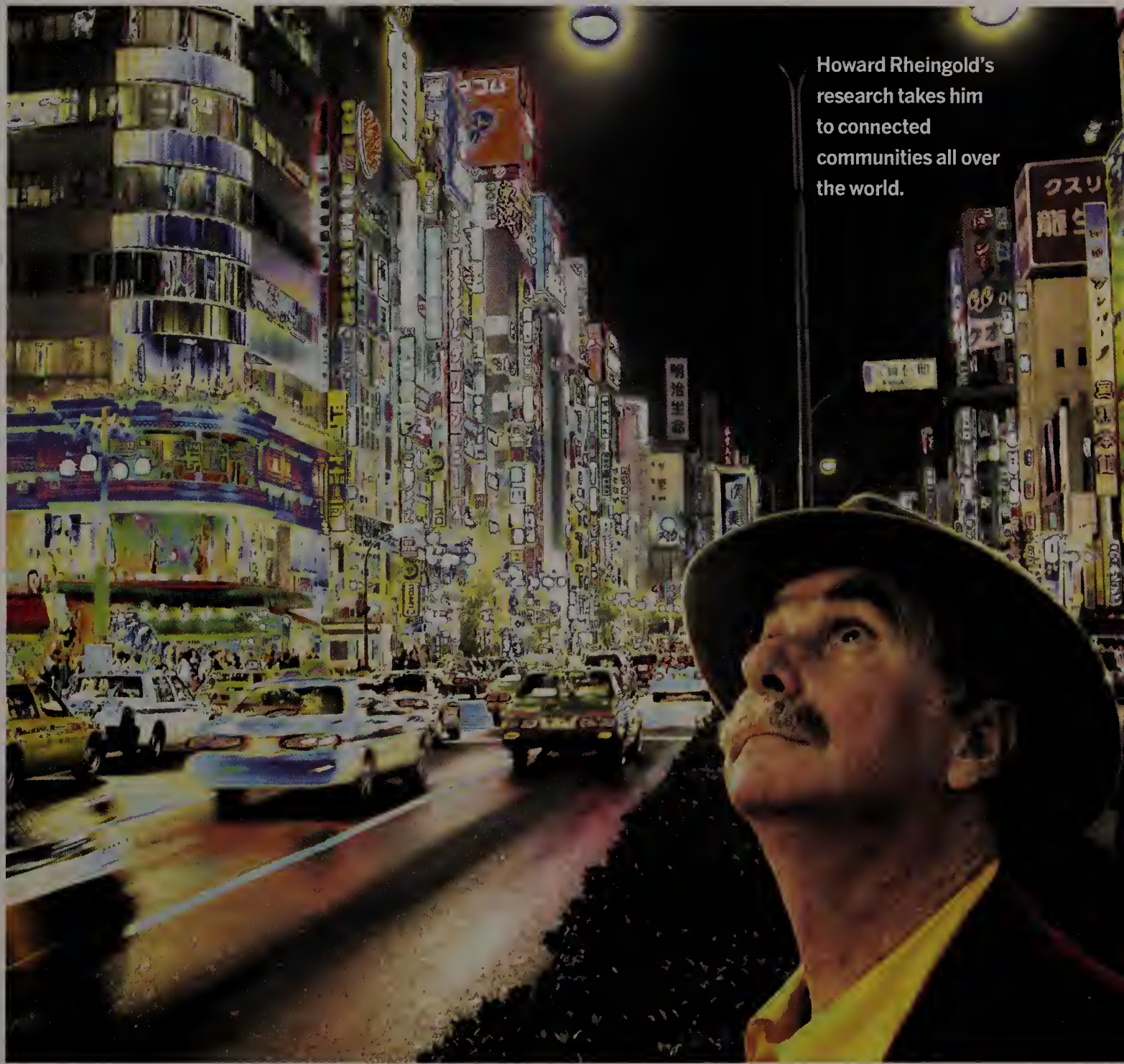
Now that portable, wearable, wireless media make it possible for people to organize ad-hoc social networks, reputation software (like the buyer-seller rating system on eBay or the way posted messages are rated on Slashdot) could enable us to find common cause with the strangers around us as we move around a city and the world, similar to the way we connect with people online. Today, you walk down the street, surrounded by people you don't know but who might be able to offer a ride in the direction you're going, buy that bicycle you're trying to sell or entertain a request for a date. Social capital leaks into the air, wasted, and nobody notices. Could mobile, networked, computationally powerful personal communication devices weave us into social networks that haven't existed before, just as eBay brings buyers and sellers into a market that never existed before?

A future of smart mobs and self-organized media is plausible as long as the owners of tomorrow's communications devices remain free to use the emerging media in any way they choose. However, a war over control of innovation might change all that, and the attack is already gathering force.

**YOU CAN SEE** this multifront war in the following trends: The recording industry's attacks on file-sharing; the motion picture industry's sponsorship of digital rights management; the collusion of politicians, computer software monopolies and hardware manufacturers to

burn "trusted computing" into future media; the moves by telephone and cable companies to fragment the Internet commons by refusing to carry traffic that competes with their own content offerings; the international adoption of versions of the Digital Millennium Copyright Act; the pressure from incumbent radio spectrum license holders to regulate future wireless communications technologies with laws formulated

Fortunately, the war isn't over—and what we know, say and do now counts. Hundreds of millions of people have tasted the freedom, power and opportunity that personal computing and the Internet have made possible. Once they understand what's at stake, they can use the very media that is the spoil of the battle to self-organize collective action. Politicians won't try to get away with quite as much if enough people know



Howard Rheingold's research takes him to connected communities all over the world.

for radio of the 1920s.

If those trends go unchecked, in a few years we will no longer be "users," free to reshape the technology as we choose, but "consumers," whose only liberty will be the freedom to decide which brand to buy. You'll have to get a license or permission from your boss if you want to make the Net or your PC do something it hasn't done before.

about it, innovators will be motivated to make yesterday's centralized media obsolete as quickly as possible, and entire populations will reshape our media environment the way we did when we built the Web by posting webpages and listing our favorite links.

The time to know, speak and act is now. The technology is in your hands. Use it well if you want to keep it that way. ■

## CIVIL LIBERTIES

# Barry Steinhardt Taming the Surveillance Monster

### PICTURE THIS: YOU'RE ATTENDING A TRADE SHOW IN LAS VEGAS.

Strolling around the city one evening, you happen upon a sex shop and pause for a moment to snicker at the curious items in the store's window. Then you continue on your way.

However, unbeknownst to you, the store's Customer Identification System has detected a radio identification signal emitted by a computer chip in one of your credit cards, and is recording your identity and the date and time of your brief stop. A few weeks later, your spouse is surprised to find in the mail a lurid solicitation from the store mentioning your visit.

You've got some explaining to do.

**THE TECHNOLOGIES** enabling that scenario already exist. The proliferation of computers, cameras, sensors, wireless communications, GPS and biometrics over just the past 10 years, along with the recent emphasis on homeland security, are feeding a surveillance monster that is growing silently in our midst. In fact, from a technical point of view, the Big Brother regime portrayed by George Orwell has now become entirely feasible.

As surveillance increases in our society, the legal chains that might otherwise restrain it are weakening. We should respond to intrusive new technologies by building stronger safeguards to protect our privacy. Instead, we are doing the opposite: loosening regulations on government surveillance, watching passively as private surveillance goes unchecked and contemplating the creation of tremendously powerful surveillance infra-

structures that will tie together disparate pieces of personal information.

For good or ill, CIOs will play a significant role in this unfolding drama. Unfortunately, many CIOs don't take the time to consider the long-term civil liberties ramifications of the technologies they're developing and deploying. But they should—the surveillance society those technologies are helping to create will not be good for American business, which for 200

years has thrived on economic and political freedom. Instead of using their technical and economic clout to loosen restrictions on surveillance—whether it be in the name of security or profits—CIOs should use that edge to push back on the corporate policies and government regulations within the USA Patriot Act that violate our civil liberties.

Sometimes willingly, sometimes unwillingly, CIOs are cooperating with government surveillance programs. The government is forcing telecommunications providers to design equipment in ways that make eavesdropping easier. The Patriot Act gives the FBI the power to demand customer records from ISPs, bookstores or any other business. It also requires financial com-

#### About the Author

» **BARRY STEINHARDT** is a lawyer and the director of the American Civil Liberties Union's Technology and Liberty Program. A frequent guest on television news and talk shows, Steinhardt also cofounded the Global Internet Liberty Campaign, and in 1998, he served as president of the Electronic Frontier Foundation.

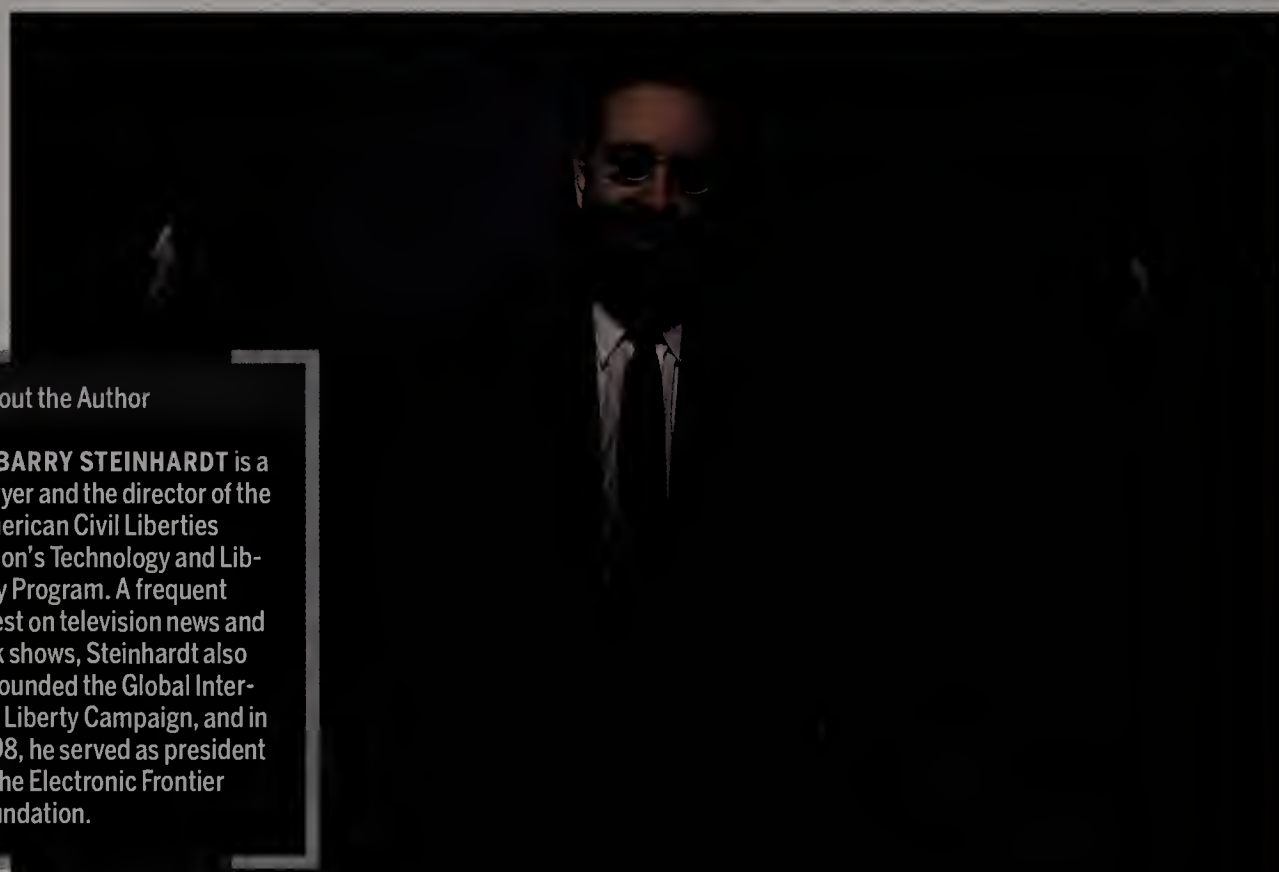
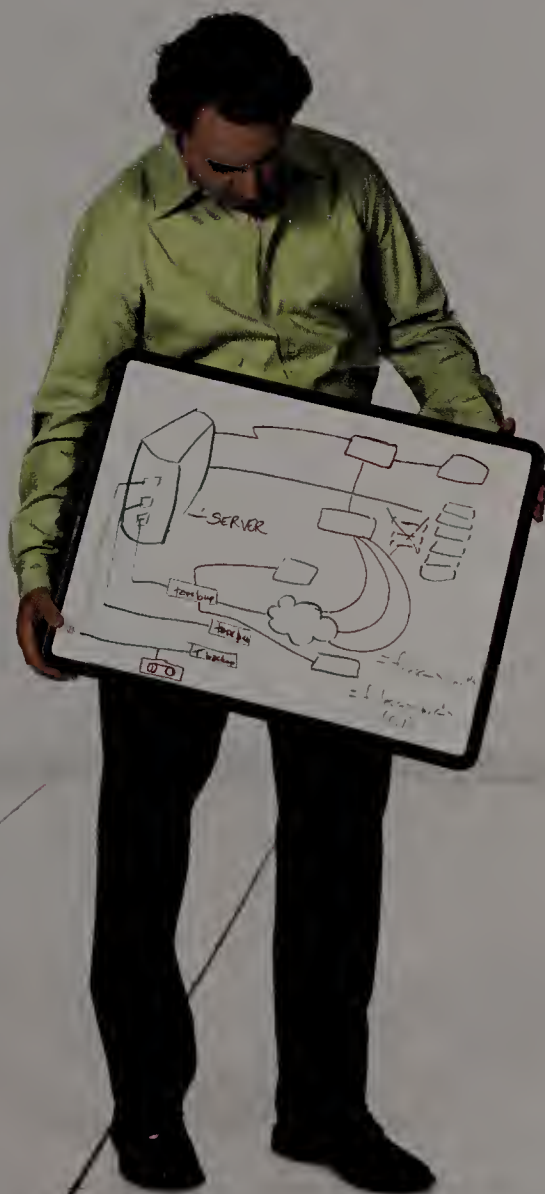


PHOTO BY RON LEVINE



I can't pull all-nighters every night.

Thing is, our backup and recovery system has to.

It can't rest.

Not even for a second.

Not if I hope to get some myself.

Save the day.

Make sure your data's always safe and you'll save yourself a lot of worry. And work. One way is with EchoView™. A potent, new data-protection appliance that continually captures and journals data as soon as it's written, for nonstop protection. And EchoView™ provides rapid recovery to any point in time, to keep business humming. So while your systems may be disrupted, your nights won't be. Learn all the ways we can help you at [www.savetheday.com](http://www.savetheday.com).

EchoView™

 **STORAGETEK®** Save the Day.™

**Steinhardt**, continued

panies to develop systems for identifying customers, flagging suspicious transactions and reporting them to the government. The *Atlanta Business Chronicle* reported in November 2002 that Bank of America had to create a whole new department to handle the government's new surveillance mandates, staffed by the financial company's workers who are, in effect, outsourced employees of the government's growing surveillance machine.

Other businesses, particularly in the IT industry, are actively pushing for expanded government monitoring—creating a kind of “surveillance-industrial complex.” This year an estimated \$115 billion is being poured into government research and development on antiterror initiatives, according to *The Wall Street Journal*, and there's no shortage of companies that want a piece of the action.

For example, Oracle CEO Larry Ellison made headlines when he called for national identity cards and promised to provide the software for them free of charge. E-mails the American Civil Liberties Union obtained as part of its effort to monitor face-recognition technology show that companies selling those systems blitzed airport officials with pitches just days after the 9/11 attacks.

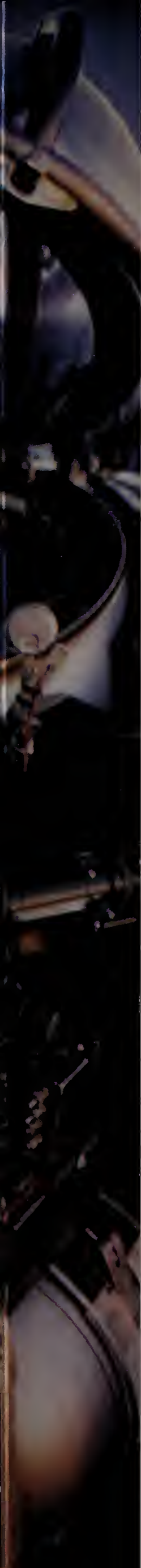
Monitoring and security might yield big profits for a few companies, but wise businesses won't join the surveillance-industrial complex. They understand that many Americans find these incursions deeply troubling. They also realize that exploiting people's personal information will likely attract negative attention as the privacy issue heats up.

CIOs know better than most citizens what today's technology can do, and because of their expertise, they are in a better position to do something about it. They can use their resources to fight new government surveillance mandates. And they can direct information systems to collect the minimum amount of data needed from customers, and store it for the minimum length of time. (Too often technologies are still designed to track and record by default, with no thought given by their creators to the value of privacy.)

It is not too late to tame the surveillance monster. Privacy is not dead, as some have suggested, but it is on life support. Heroic measures—including help from CIOs—are needed to save it. ■

PHOTO BY KIP EVANS





## EXPLORATION

# Robert Ballard 20,000 Leagues Over the Web

**MAN HAS ALWAYS REGARDED WHAT LIES BENEATH THE WORLD'S** oceans with both fear and fascination, but the frigid temperatures and enormous pressure of the deep render the human body an ineffective tool for exploring this inhospitable environment. Techno-

logical innovations like the Aqua-Lung, the bathysphere, remotely operated vehicles (ROVs) and deep sonar systems have helped us reach farther into the deep and unlock some of its mysteries. The more we learn, however, the more we realize we're only scratching the surface.

Technology helps us go deeper, see better, handle objects or bring other people along for a virtual ride. The technologies we used for last summer's mission to the Black Sea and the Eastern Mediterranean fulfilled several of my primary scientific and philosophical objectives. The first was to improve access to submerged targets with advanced ROVs like our new unmanned submersible *Hercules*, which is hardened to the extremes of the deep—the darkness, the temperatures that are either numbingly cold or meltingly hot, the inconceivable pressures. The second was to provide the sensory feedback we need for remote exploration. *Hercules* is

fitted with high-definition video and force-feedback manipulator arms that helped us perform deepwater archaeology and excavation in a way never before possible, handling centuries-old artifacts with the delicacy of a human hand.

We also, for the first time ever, connected to other scientists and researchers (as well as the public) by wiring our mission live via satellite and Internet technology. No one had ever done this at the level of sophistication that we did during this mission. It opened a window into the process of scientific discovery and allowed a shared view never before possible.

**I HAVE ALWAYS** believed that the constraints of time, money and access to great talent have slowed the pace of scientific discovery. Imagine being able to connect to the greatest scientists in the world while a mission is under way, showing them what you've discovered and being able to ask—in real-time—"What am I looking at?"

In the past, it might have taken months,

or years, to vet a finding from an expedition through the scientific community members and tap into their talent and knowledge. It would then take months or years more to raise the funds to go back to sea with the right expert on board. Now, if we need an expert in biology or a certain geologist, he can tap into the live feed and help us while the mission is still in progress.

This level of connectivity will advance the pace of scientific discovery exponentially. In the same way, this live mission broadcast has turned the expedition into an educational experience. Children all over the world will be able to follow the mission as it's happening.

There's a lot of ocean out there. And there's a lot of history buried beneath it. The future of

deep-sea exploration will be extraordinary. We will move from ROVs to autonomous, intelligent underwater vehicle systems that will be able to explore the deep ocean bottom—doing geologic surveys or acting as videographers of the deep—without being on a leash, without being limited by their human pilots' vision and stamina.

The kids who followed last summer's mission over the Web will tomorrow lead the world in new deep-sea discoveries, giving us new answers to old questions, and embarking on incredible new adventures. ■

### About the Author

» **ROBERT BALLARD** has led or participated in more than 100 deep-sea expeditions, including the discovery of the *RMS Titanic*, the German battleship *Bismarck* and the ocean liner *Lusitania*. He is the founder and head of the Institute for Exploration and has written more than 50 articles and several books about his explorations and discoveries.

Connecting research vehicles like *Deep Worker*, pictured here with Robert Ballard, via satellite and Internet to the greatest scientists in the world will advance the pace of scientific discovery exponentially.



## Sales and Services

### CIO SALES OFFICES

**President** Walter Manninen

**Publisher** Gary J. Beach • 508 935-4202

**Executive VP Sales/Custom Publishing**  
Ellen Romanow • 508 935-4796

### East Coast

**Senior VP Sales/East**

Michael J. Masters • 201 634-2330

**Senior Regional Mgr.**

Kathy Powers • 201 634-2331

**Regional Sales Manager**

Ellie Schwab • 201 634-2332

**Account Executive**

Joan Bonadeo • 201 634-2328

**Advertising Sales Associates**

Rhonda Goodman • 201 634-2329

Sharon Patrick • 201 634-2333

Fax • 201 634-9513

### New England

**Senior Regional Manager/Advertising Sales**

Len Ganz • 508 935-4039

**Senior Advertising Sales Associate**

Dawn Cora • 508 935-4092

Fax • 508 879-6063

### Mid-Atlantic

**Senior Regional Manager/Advertising Sales**

Louise Cupelli • 215 627-8117

**Account Executive**

Maureen Welsh • 215 928-9151

**Advertising Sales Associate**

Meredith Hagan • 215 627-8114

Fax • 215 627-8224

### South Central

**Regional Director/Advertising Sales**

Robert E. Sawdon • 512 306-9801

**Senior Advertising Sales Associate**

Brenda Garza • 512 306-9801

Fax • 512 306-9805

### North Central

**Regional Sales Manager**

Christopher Nolan • 847 441-3143

**District Sales Manager**

Beth DeVillez • 847 441-3140

**Advertising Sales Associate**

Kim Giovanni • 847 441-5005

Fax • 847 441-5150

### West Coast

**VP Sales/West**

Cheri Parr • 415 975-2685

**Senior Regional Manager/Advertising Sales**

Jane Evans • 415 975-2680

**Regional Manager/Advertising Sales**

Ai Collins • 415 975-2686

**Account Executives**

Derek Jung • 415 975-2683

Tom Ocampo • 415 975-2693

Fax • 415 543-2358

### Southern California

**Regional Sales Manager**

Chris Bramel • 949 475-5579

**Account Executive**

Issac Ugay • 949 475-5579

Fax • 949 475-5583

### LIST SERVICES

**List Services Director**

Kathryn A.W. Marston • 508 935-4072

**List Services Account Executive**

Stephanie Roy • 508 935-4151

**List Services Coordinator**

Kim Cormican • 508 935-4152

### ONLINE SERVICES

**VP/Online Sales**

Lisa Brown • 508 935-4470

**Online Sales Manager**

Michael McPhee • 508 935-4611

### CUSTOM PUBLISHING

**Group Director** • Michael Siggins

**Director** • Mary Gregory

**Director of Content Development** • Tom Field

**Project Managers** • John Danielowich, Amy Greenleaf

**Graphic Designer** • Chris Brown

### REPRINT SERVICES

For article reprints (500 quantity or more), please contact Chad Johnston at RSiCopyright (651 582-3800) or via e-mail at [cioreprints@rsicopyright.com](mailto:cioreprints@rsicopyright.com).

### CIO IS PUBLISHED IN THE UNITED STATES AS WELL AS IN:

**Australia**, CIO Australia [www.idg.com.au](http://www.idg.com.au)

**Canada**, CIO Canada [www.lti.on.ca/cio](http://www.lti.on.ca/cio)

**China**, CEO & CIO China [www.ceocio.com.cn](http://www.ceocio.com.cn)

**France**, CIO France [www.idg.fr/cio](http://www.idg.fr/cio)

**Germany**, CIO Germany [www.cio.de](http://www.cio.de)

**India**, CIO India 91-80-521-0309/12

**Japan**, CIO Japan [www.idg.co.jp](http://www.idg.co.jp)

**New Zealand**, CIO New Zealand [www.idg.co.nz](http://www.idg.co.nz)

**Norway**, CIO Business Standard

[www.business-standard.no](http://www.business-standard.no)

**Poland**, CXO Poland [www.cxo.pl](http://www.cxo.pl)

**Singapore**, CIO ACEN/Hong Kong

[www.idg.com.sg](http://www.idg.com.sg)

**South Korea**, CIO Korea [www.cio.seoul.kr](http://www.cio.seoul.kr)

**Sweden**, CIO Sweden [www.cio.idg.se](http://www.cio.idg.se)

For further sales information, visit [www.cio.com/marketing/salesoffices.html](http://www.cio.com/marketing/salesoffices.html).

## CIO Contact Information

Editorial, Advertising and Business  
Offices: 492 Old Connecticut Path,  
P.O. Box 9208, Framingham, MA  
01701-9208, 508 872-0080.

CIO (ISSN 0894-9301) is published  
semimonthly and as a combined issue  
December 15/January 1, plus a special  
issue by CXO Media Inc., 492 Old  
Connecticut Path, P.O. Box 9208,  
Framingham, MA 01701-9208. Period-  
icals postage paid at Framingham, MA,  
and at additional mailing offices. Canada  
Publications Mail Agreement Number  
1902075. CANADIAN POSTMASTER:  
Please return undeliverable copy to P.O.  
Box 1632, Windsor, ON N9A 7C9.

Permissions: Copyright 2003 by  
CXO Media Inc. All rights reserved.  
Reproduction of material appearing in  
CIO is forbidden without written  
permission. Send all requests to  
Permissions Department, CIO, 492  
Old Connecticut Path, P.O. Box 9208,  
Framingham, MA 01701-9208.

Photocopy Rights: Permission to  
photocopy for internal or personal use  
or the internal or personal use of  
specific clients is granted by CIO for  
users through the Copyright Clearance  
Center, provided that the base fee of \$3  
per copy of the article, plus \$.50 per  
page is paid directly to Copyright  
Clearance Center, 27 Congress Street,  
Salem, MA 01970. Please specify: ISSN  
0894-9301. Permission to photocopy  
does not extend to contributed articles  
followed by this symbol: ♢.

Subscriptions: Address inquiries to CIO,  
P.O. Box 489, Northbrook, IL 60065-  
0489; 866 354-1125. CIO is free to  
qualified information executives. To all  
others the one-year basic rate is \$150  
for the United States and Canada, \$195  
to foreign countries (payable in U.S.  
funds only). The single copy price is \$9.  
Please allow four to six weeks for new  
subscriptions to begin.

Change of Address: Please go to  
[www.ameda.com/custsrv/cio](http://www.ameda.com/custsrv/cio) and  
follow the online instructions.

Postmaster: Send change of address to  
CIO, P.O. Box 489, Northbrook, IL  
60065-9816. Printed in the U.S.A.

## Index of Companies and Advertisers

Page numbers refer to the first page of the article(s) in which the  
company has a substantial mention. This index is provided as a  
service to readers. The publisher does not assume any liability for  
errors or omissions.

### COMPANY INDEX

City Index Ltd. .... 28  
Deutsche Bank AG .... 28  
Foresight Institute .... 22  
Forrester Research Inc. .... 36  
Gartner .... 36  
Gillette Co., The .... 48  
Goldman Sachs & Co. .... 28  
GrameenPhone Ltd. .... 12  
Iempower Inc. .... 28  
Indiana Heart Hospital, The .. 52

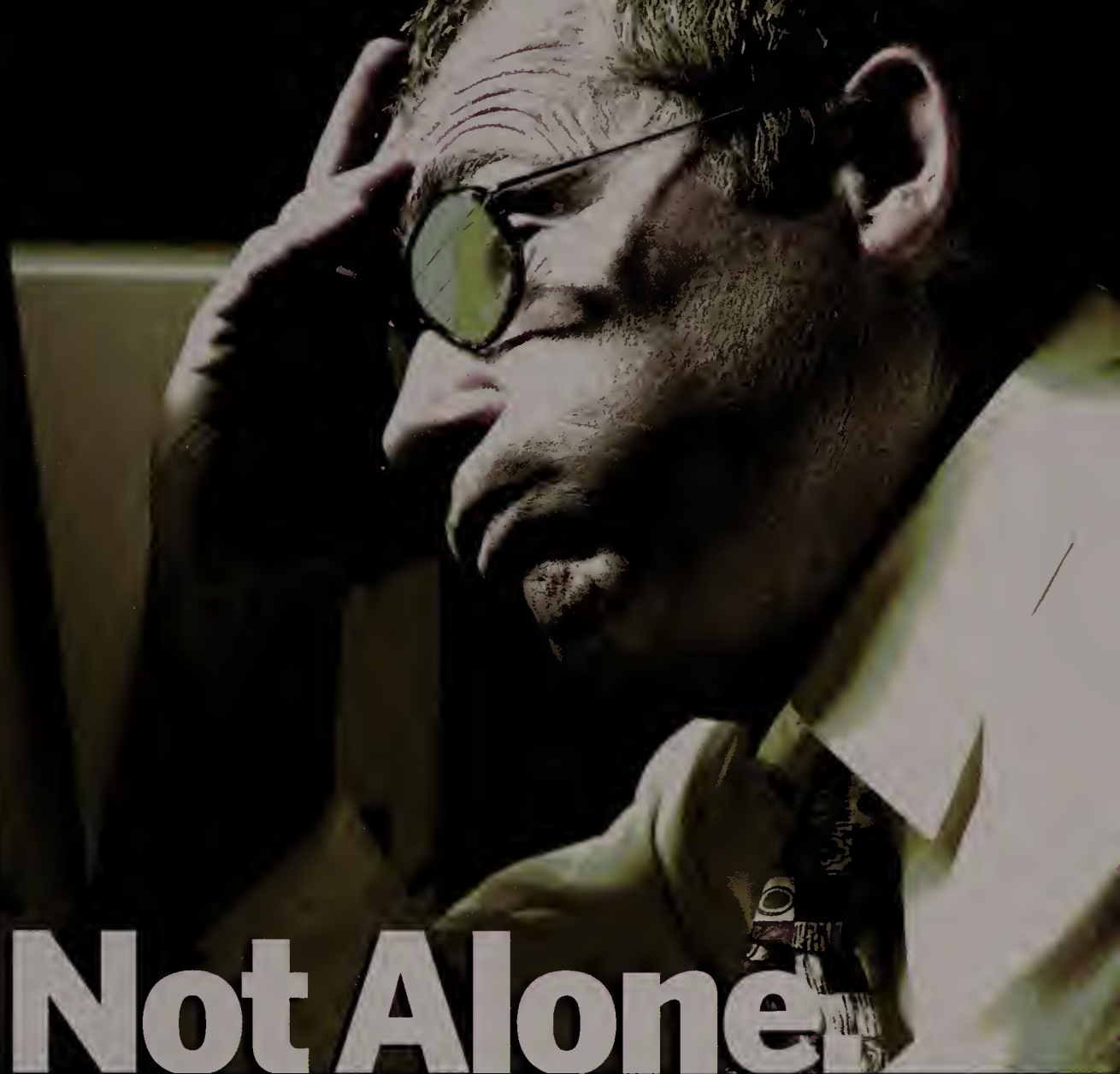
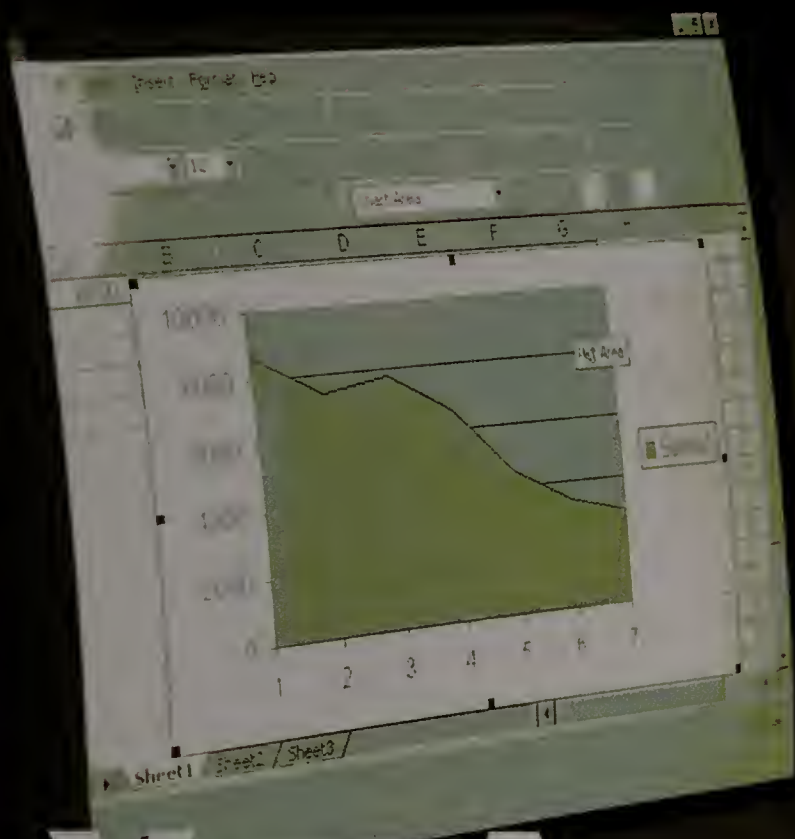
Intel Corp. .... 12  
IPKO Institute .... 12  
iRobot Corp. .... 12  
Massachusetts Institute of  
Technology .... 12  
Mayo Foundation .... 52  
Metropolitan Hospital Center . 52  
Microsoft Corp. .... 48  
MSNBC Cable LLC .... 28  
National Broadcasting  
Co. Inc. .... 28  
nTAG LLC .... 48

Oracle Corp. .... 62  
Sharper Image Corp. .... 68  
TiVo Inc. .... 68  
UniNet Communications .... 12  
Wal-Mart Stores Inc. .... 48  
Xerox Corp. .... 12

### ADVERTISER INDEX

3COM Corp. .... 15  
American Power  
Conversion .... 26, 27  
AMS .... 38, 39  
BearingPoint Inc. .... 55  
Computer Associates  
International Inc. .... 10  
CXO Media Inc. .... 42, 52, 67  
EDS Corp. .... 5

EMC Corp. .... 35  
Enterasys Networks .... 9  
Forrester Research Inc. .... C3  
Fujitsu Technology  
Solutions Inc. .... 49  
Hewlett-Packard Co. .... C2, 2  
IBM Corp. .... 17, 20  
PeopleSoft Inc. .... 57  
Siemens Corp. .... 7  
Software AG .... 25  
Sprint .... 31  
StorageTek .... 63  
Sun Microsystems Inc. .... C4  
XO Communications .... 13



# You Are Not Alone.

"The Select Member CIO you put me in touch with was knowledgeable, forthcoming and extremely helpful. His shop and ours have much in common. The call was excellent!"

*-CIO of a \$7 billion insurance company*

"I am getting tremendous value out of the board-level presentations I have downloaded from Select."

*-CIO of a \$3 billion manufacturer*

BENEFIT FROM THE EXPERIENCE OF YOUR PEERS —JOIN CIO SELECT.

CIO Select is an exclusive networking program that helps CIOs share ideas, documents and advice.

Membership in CIO Select is reserved for CIOs of midsize to large organizations.



The Resource for  
Information Executives

## CIOSelect

AN EXCLUSIVE PEER SERVICE FOR CIOs

For Information and Membership Pricing:  
Contact Martha Heller, Director, CIO Select,  
at 508.988.6738 or [mheller@cio.com](mailto:mheller@cio.com) or  
via [www.cio.com/community/select.html](http://www.cio.com/community/select.html).

## EVOLUTION

# Andy Borowitz Danger, Stupid Human! Danger!

**OUR WORLD IS BECOMING A SMARTER PLACE. WE HAVE SMART PHONES, smart cards and smart bombs, where once we had only stupid phones, idiot cards and really dopey bombs. This unprecedented surge in smartness, however, applies only to inanimate objects and has avoided humans altogether. In**

fact, as our high-tech devices have grown smarter, we've become much more dim-witted. These two trends, I hasten to add, are not unrelated.

Charles Darwin saw things differently. His theory of natural selection held that humans

would continue to get smarter and smarter so that by the year 2525 (if man were still alive), we would have gigantic brains contained within enormous heads, and possibly great big throbbing and glowing foreheads too. (Don't try to find the part about the foreheads in *Origin of Species*. I'm just paraphrasing here.)

Unfortunately, at some point during the last century, Darwin's theory jumped the rails. It stopped applying to us and started applying only to our electronic devices, especially those sold at The Sharper Image. Man's brainpower began to devolve the moment he

picked up the first TV remote. This devolution picked up speed with the advent of picture-in-picture technology, which enabled man to watch an NFL game and the Pam Anderson *VIP* series simultaneously. TiVo and the VCR are also implicated here, making it possible for family members to watch whatever they want whenever they want, thus eliminating the need for human contact and the rancorous screaming matches that are essential to the development of a rich vocabulary.

The most innocent and seemingly helpful devices are, in fact, causing our brains to shrivel up like a thumb that's been in the bathtub too long. A car's global positioning system does, as advertised, help position us on the globe. It also strips us of our ability to read maps, plan itineraries and, ultimately, find our way from the bedroom to the bathroom.

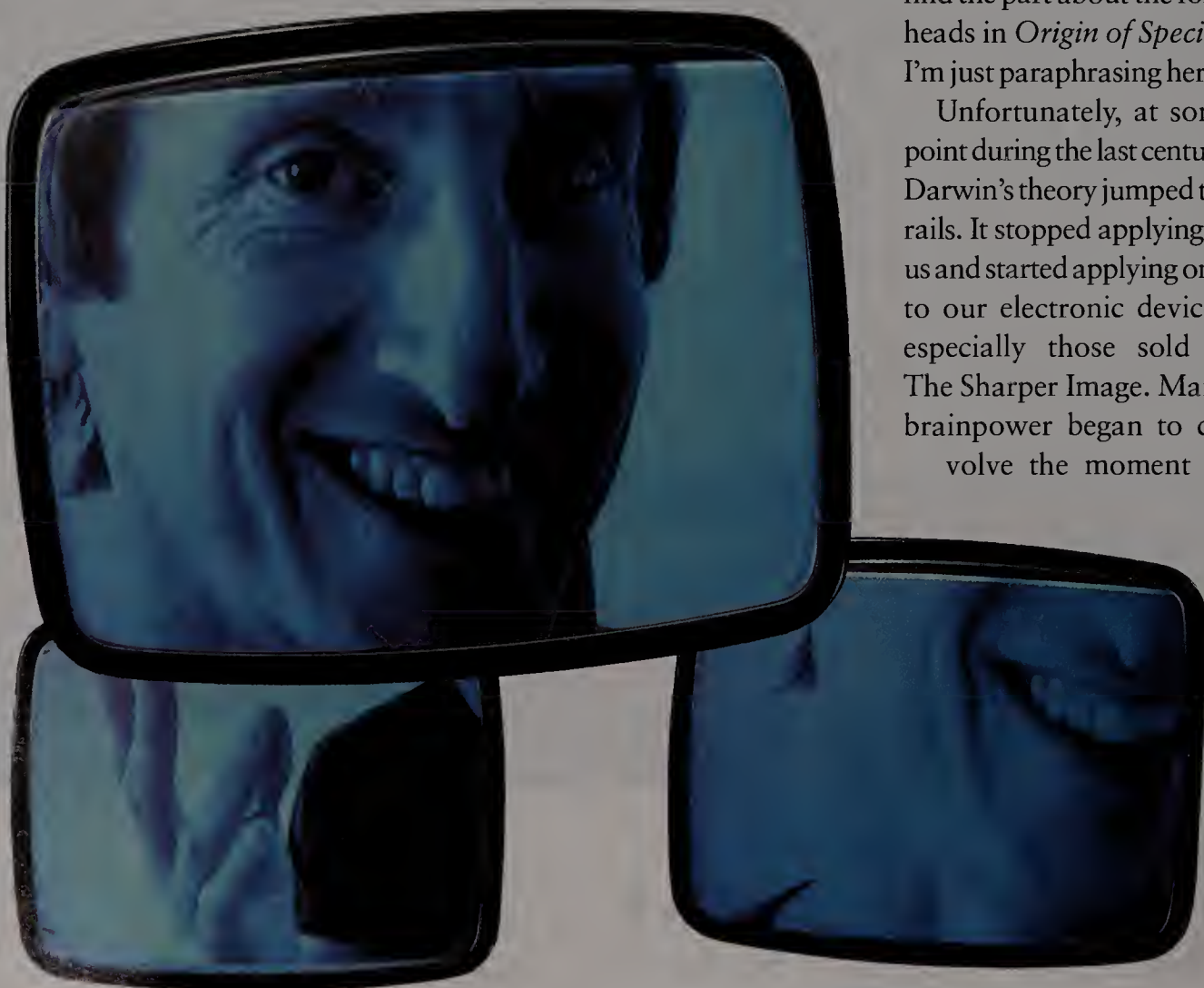
Our sense of direction now thoroughly degraded, we find tasks that used to be simple, like grocery shopping, well-nigh impossible without the assistance of yet another ubiquitous electronic device, the cell phone. Walk into a suburban supermarket and you'll see a number of lost-looking husbands, their own navigational systems shot to hell by their reliance on GPS technology. They're the ones on the phone grunting "uh-huh" as their wives guide them to the precise location of the 1 percent milk. This is progress? We've turned picking up a quart of milk into a mission as fraught with complexity and danger as Apollo 13.

Does all of this mean, as many sci-fi films would seem to warn us, that machines are destined to rule the world, after turning us into their sex slaves? (I may have seen different sci-fi films than you.) I don't think so. We may be stupider than our inventions, but we're better built, and for a simple reason: We didn't build ourselves. The average American has a life expectancy of 75 years, while the average VCR breaks after six weeks.

We may be a bunch of chowderheads, but time is on our side. ■

### About the Author

» **ANDY BOROWITZ** is a comedian, actor and author whose latest book is *Who Moved My Soap? The CEO's Guide to Surviving in Prison*. He appears regularly on CNN's *American Morning* and NPR's *Weekend Edition*, and is also the creator of the television series *The Fresh Prince of Bel-Air*, as well as producer of the Oscar-nominated movie *Pleasantville*.



# WE'VE ADDED CATERING TO OUR IMPRESSIVE LIST OF SERVICES.



## INTRODUCING THE CIO GROUP

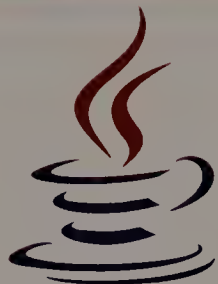
Hello, we'll be your server today. What may we bring you? Member-driven research? Best practices? Industry specific data and insight? Peer-to-peer networking? Or may we suggest the one-on-one relationship with a senior Forrester analyst? (It's excellent today.)

We'll be at 1-866-569-7090 if you need anything. Very good, then.

1983 **FORRESTER®** 2003

[www.forrester.com/theciogroup](http://www.forrester.com/theciogroup)

# DOES IT ALL



Java™ Enterprise System

THE JAVA™ ENTERPRISE SYSTEM – EVERY NETWORK SERVICE YOUR BUSINESS NEEDS – CLUSTERING, CALENDAR, DIRECTORY AND IDENTITY SERVICES, INSTANT MESSAGING, PORTAL, WEB SERVER AND APPLICATIONS SERVER – DONE TO PERFECTION.

SUN.COM/TRYIT



# SOFTWARE FROM SUN!



Java™ Enterprise System

CERTAINLY, SUN IS KNOWN FOR IT'S INNOVATIVE HARDWARE. BUT JUST AS WE REVOLUTIONIZED THE HARDWARE BUSINESS, WE'RE NOW TRANSFORMING SOFTWARE FOR OUR CUSTOMERS WITH THE JAVA ENTERPRISE SYSTEM.

SUN.COM/TRYIT



# \$100 SAVES MILLIONS



Java™ Enterprise System

INSTEAD OF SPENDING \$1000s PER EMPLOYEE ON SOFTWARE, SPEND \$100. THAT CAN SAVE YOUR BUSINESS MILLIONS ALONE, BUT THE SUPPORT AND TRAINING ARE INCLUDED WITH THE JAVA ENTERPRISE SYSTEM CAN SAVE YOU EVEN MORE.

SUN.COM/TRYIT



# PREDICTABLE ISN'T BORING



Java™ Enterprise System

GETTING SCHEDULED UPGRADES THAT ARE 100% COMPATIBLE WITH PREVIOUS VERSIONS ISN'T BORING. NEITHER IS THE NO – SURPRISE PRICING OF THE JAVA ENTERPRISE SYSTEM. PREDICTABLE IS REVOLUTIONARY.

SUN.COM/TRYIT



# RADICAL SIMPLICITY



Java™ Enterprise System

DESIGNED TO BE SIMPLE – YET TOTALLY COMPATIBLE – WHETHER YOU'RE INTEGRATING WITH YOUR OWN, OR THIRD PARTY SOFTWARE. SIMPLE MEANS MAXIMIZED SECURITY, EFFICIENCY, AND SCALABILITY.

SUN.COM/TRYIT



# OPEN



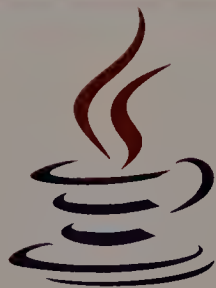
Java™ Enterprise System

RUN IT ON SOLARIS OR LINUX, INTEGRATE 3RD PARTY SOFTWARE, ACTIVATE ONLY WHAT YOU NEED, ADD USERS AS REQUIRED, WE BUILT THE JAVA ENTERPRISE SYSTEM TO BE OPEN – FOREVER.

SUN.COM/TRYIT



# TESTED ON FRIENDS



Java™ Enterprise System

WE CREATED THE JAVA ENTERPRISE SYSTEM TO RUN SUN – INCREASING OUR PRODUCTIVITY WHILE PERFECTING A PRODUCT THAT SAVES US MILLIONS PER YEAR. WE THEN LICENSED A TEST VERSION TO SOME OF OUR BEST CUSTOMERS – AND NOW WE'RE EVEN BETTER FRIENDS.

SUN.COM/TRYIT



# BENEFITS



Java™ Enterprise System

THE JAVA ENTERPRISE SYSTEM IS SECURE, INTEGRATED, PREDICTABLE, EFFICIENT, SIMPLIFIED, STANDARDIZED, LOWER COST, UPGRADEABLE, OPEN AND A HECK OF A LOT EASIER TO MANAGE.

SUN.COM/TRYIT



# TRY IT FREE



Java™ Enterprise System

THINK PREDICTABILITY IS AS EXCITING AS WE DO? FIND OUT JUST HOW MUCH THE JAVA ENTERPRISE SYSTEM CAN DO FOR YOU.

GET A FREE SELF-ASSESSMENT TODAY.  
SUN.COM/TRYIT

SUN.COM/TRYIT

